EXCLUSIVE REPORT:

SKULL-BUSTING FOR SAFETY-pg 22

SPORTS CARS ILLUSTRATED

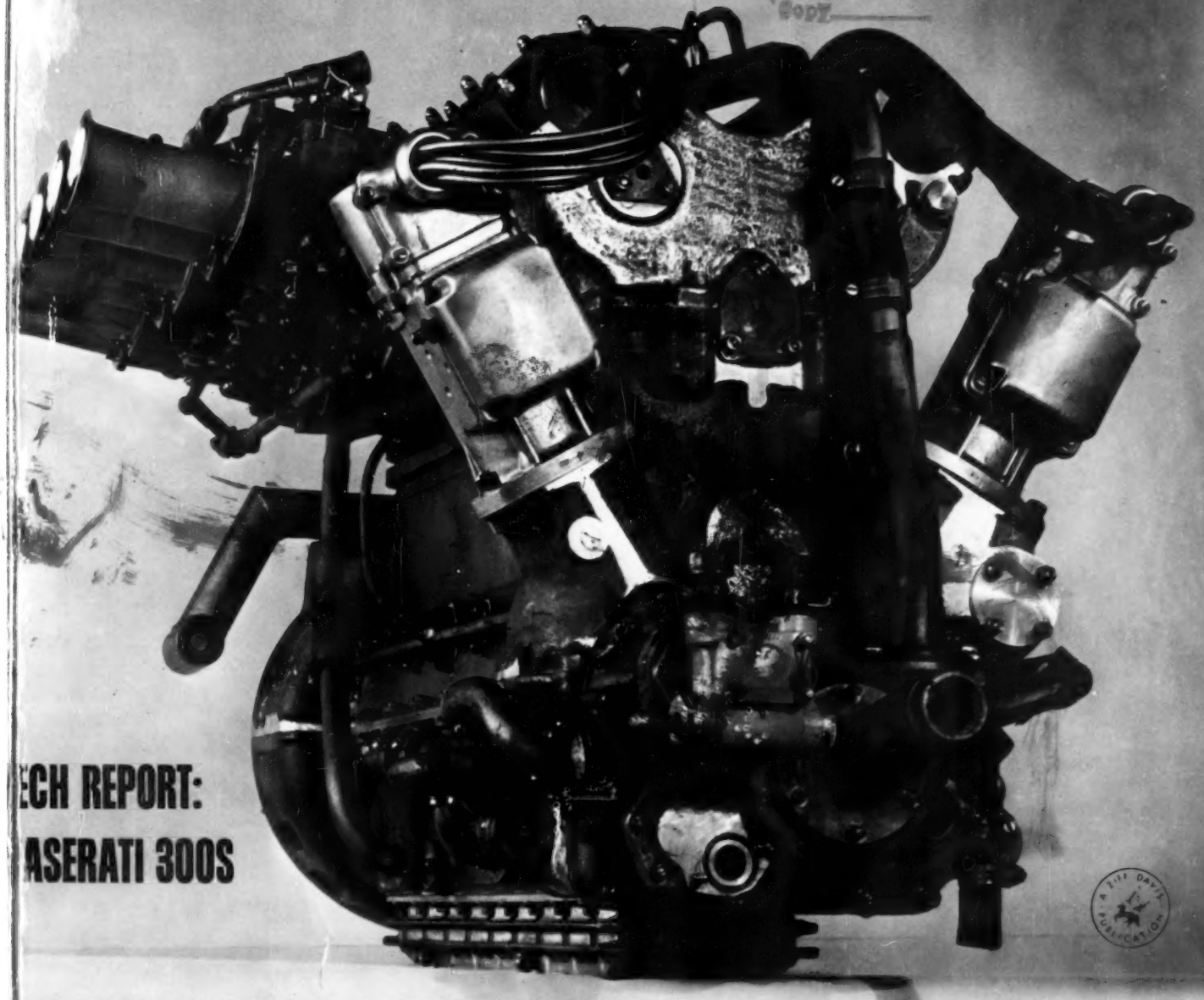
B 659439

BEGINNING THIS ISSUE:

300BHP FROM 150 INCHES:

HOW DO THEY GET IT?

JULY 1957 35¢
JUL 18 1957

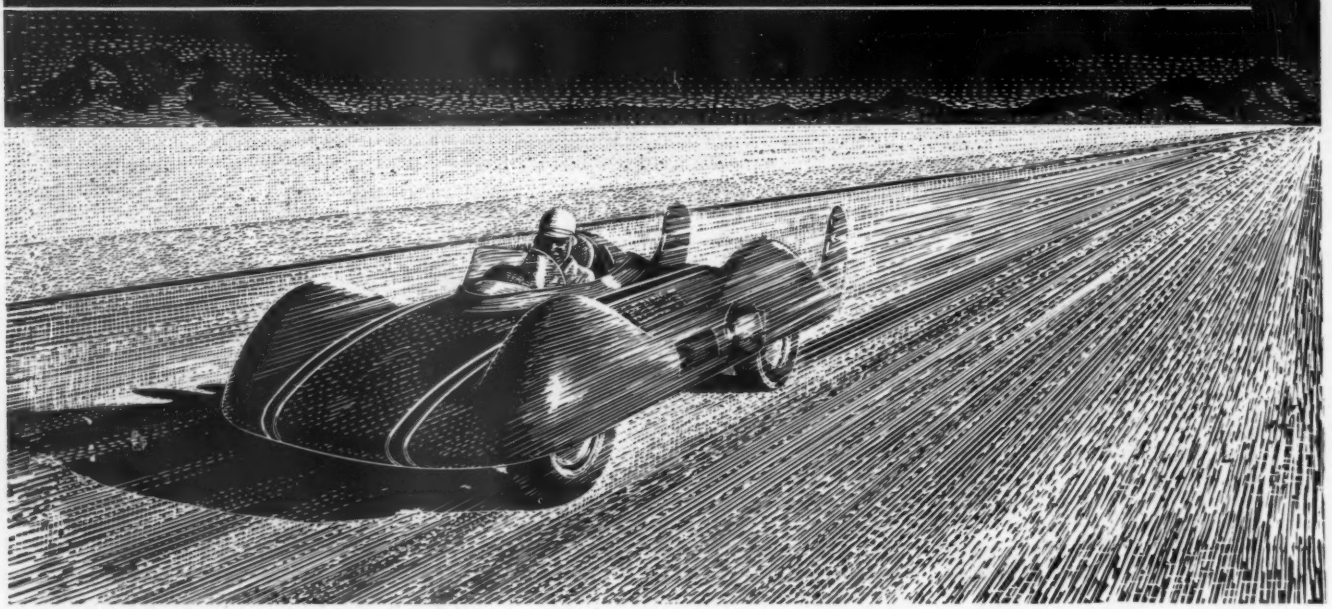


TECH REPORT:

MASERATI 300S

FORD'S 400 HORSEPOWER BIRDS

Turbine engine for your car?



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Shooting Star illustration courtesy Longines, official timepiece for the Renault record run.

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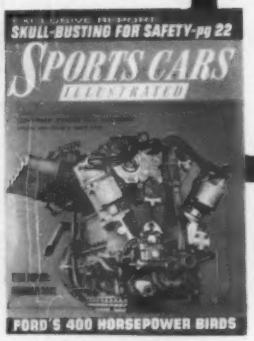

This month's cover is our third engine shot and shows the fantastic 300-S Maserati six, the whole car being covered in our centerspread complete with cutaway. Cover Ektachrome is by Ted Mathews.

SPORTS CARS ILLUSTRATED

july 1957
no. 1 vol. 3

Incorporating AUTO MECHANICS

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NOTE: Sports Cars Illustrated's companion magazine, Auto Mechanics, is suspending publication with its May-June issue. Many of the fine features it held will appear in this and future issues of Sports Cars Illustrated.—The Editors.

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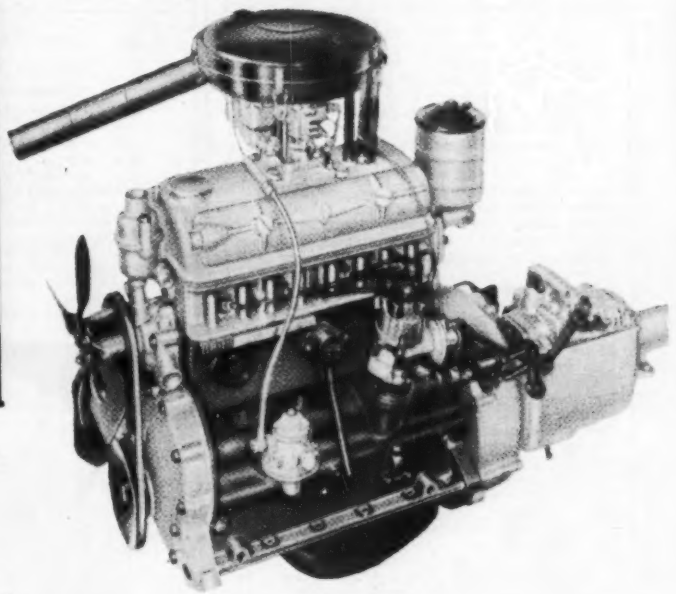

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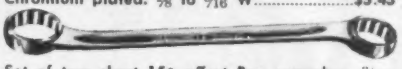

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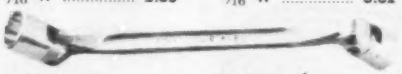
¼ W	1.99	½ W	3.66
5/16 W	2.36	9/16 W	3.82



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7 mm	1.05	11 mm	1.59	17 mm	2.36
8 mm	1.12	12 mm	1.82	19 mm	2.71
9 mm	1.12	13 mm	1.82	21 mm	3.19
		14 mm	1.99	22 mm	3.19

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14 & 15 mm	1.01 ea.	26 mm	$1.48
16 mm	1.04	27 & 28 mm	1.70 ea.
17 to 22 mm	1.19 ea.	30 mm	1.81
23 to 25 mm	1.44 ea.	32 mm	1.92

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very sincerely yours:

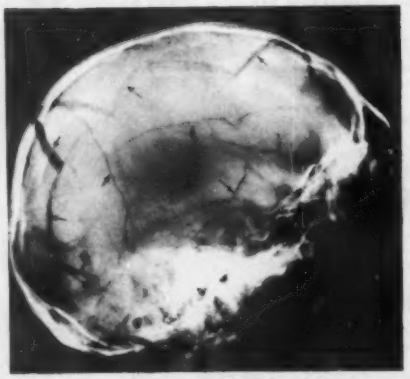
As of April 28, 1957, the Machpi helmet is banned for use in competition in the New England region of the Sports Car Club of America for reasons which will become apparent on inspection of the accompanying photos. The immediate cause for the precipitate banning, however, was due to the fact that one of these helmets literally disintegrated when the wearer, Paul Sagan, rolled in his Porsche at a regional race at Lime Rock, Connecticut, on the above date.

This, of course, ties in directly with Dr. George Snively's shocking report on page 22 of this issue. One direct result of Dr. Snively's tests, we are happy to report, is that all but two (as of this writing) of the manufacturers are recalling their products so they can be fitted with the non-resilient foam-plastic liners which the tests indicated were so vital. One thing we want to make clear right now is that the vast majority of the helmet manufacturers are honorable and ethical people who want to make a good product. The fact that their helmets were inadequate in the past cannot be considered an error of omission or commission on their part. The supply of cadavers is limited and, gruesome though the thought may be, without such facilities it is impossible to know accurately what constitutes protection for the human skull. Now, thanks to Dr. Snively and his associates these manufacturers are equipped with the necessary knowledge to do their job. It is to their credit that they are doing so with such alacrity. Further, many of these manufacturers will reline helmets now in the hands of the racing fraternity with the recommended foam liners. Write to the manufacturer of your particular breed of crash hat and ask for further information. There will probably be a nominal charge for the service but believe us, it's worth it.

• • •

Last month our lead article concerned itself with the so-called "Race of Two Worlds" scheduled for Monza on June 29. In this we pointed out that the course was rough, sort of like driving up and down steps. According to European standards it *is* rough. What we didn't take into consideration, however, was that the American drivers (and cars) are used to race tracks that are *really* rugged. Places like Langhorne and Dayton, to say nothing of the various fairground circuits, are like shell-holed battlefields in comparison. According to Duane Carter, who watched Pat O'Connor lap the Monza oval in the Firestone test car at nearly 171 mph, the Kurtis and its driver looked far more comfortable than the European cars and drivers he watched during last year's GP of Italy. Another point of interest was Carter's report that both Ferrari and Maserati are preparing Indianapolis type cars with solid axles and big engines for this event. This, coupled to Duane's comment that a good driver is a good driver no matter what his land of origin and that the only difference he could see between our handlers and theirs was the equipment used, indicates that Monza is still anybody's race.

— john christy



No less than nine fractures occurred in this skull when the Machpi helmet (right) with which it was fitted was subjected to 34 mph blow. For full details of these helmet tests, turn to page 22. Helmet above is banned.

letters

model bombs

I grew tired of just *looking* at my 15 inch MG and 17 inch Jaguar, so I decided to put some sort of power in them. In the Jag a Dyna-Jet engine has done many things that the real Jaguar owners would never dream of.

Sincerely,
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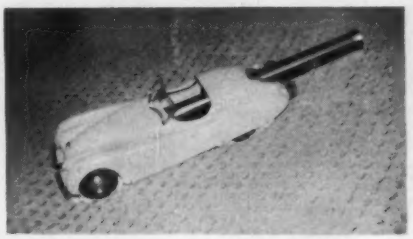

panhard plaudits

In your January, '57 issue you printed a letter from a reader who asked if there was available in the U.S. a car with four passenger space, adequate trunk space, and the emphasis placed on quality of engineering rather than on chrome trim. Your answer was No. I think your answer is in error because the Panhard Dyna fits these specifications to a "T". The Panhard has what it takes to bring home the iron in its class (G). and even if your right foot is made of lead you can still average 25 mpg in town, and the better part of 35 mpg's on the open road. I averaged 34 mpg with an untuned engine driving from Hayward, California to Salem, Oregon — a distance of some 700 miles.

Of the two front wheel drive cars presently being sold in the U.S. for about $2,200, Panhard is by far the superior. My wife and I have driven both and found the Panhard shows no tendency to handle like a truck at low speeds, even while cornering. The roller bearing engine was designed for long life — it takes over 5,000 miles to break one in. I have about 3,000 on mine and it's still fairly tight. As to the chrome end of the reader's dream car, Panhard has no chrome at all — its trim being all aluminum which ends the rust problem once and for all. Jack Meter of Meter Motors, Hayward, California, handles the Panhard in the greater bay area, and I'm sure he can satisfy the desire for a Panhard at a reasonable price.

Anyone interested in starting a Panhard Owners Association here in the U.S. please drop me a line.

Yours sincerely,
Robert L. Sharp
4535 State Street
Salem, Oregon

(Continued on page 10)

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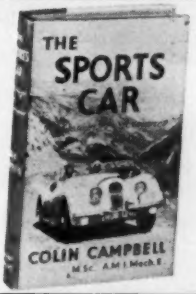

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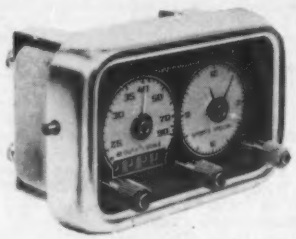

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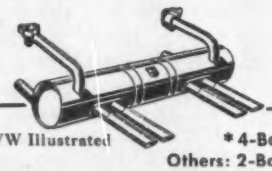

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(Continued from page 7)

pro

I would like to say that I enjoy your magazine very much. I think it fills the gap between hot-rodding and sports cars very nicely, which is something that a lot of us car fans have been waiting for. In answer to people who talk about "pure bred" sports cars – I think they will find that some of the best sports cars started out as hot rods. For example, MG, Lotus, Allard, Ferrari, Nardi, etc., and that most sports car owners have either tinkered with or out and out souped their cars which puts them in the category of hot-rodders. Let's not have any more of this bluenose stuff. I think it's for dreamers and rich men.

Yours truly,
Jay Downing
Providence, Rhode Island

Amen.—Ed.

con

The title of your magazine is "SPORTS CARS ILLUSTRATED". Why not keep the magazine in the field for which it was originally intended? Remember there are hundreds of hot rod and special magazines that are written for the small group of men who are primarily interested in those cars. The actual production sports cars are getting more and more widely known and used and there is no magazine that caters to this growing reader audience exclusively. I would make a guess that for every enthusiast who likes to tear down and rebuild a car there are at least ten who use their cars just for the pleasure of driving a car that is wonderful to drive. I am in the latter class.

What I am trying to say is that a little of the hop-up in your magazine goes a long way. We men who use the production type of car need a magazine for US. What do you say?

Yours sincerely,
Hollin B. Abrams
Russellville, Alabama

Sorry – we have to contradict your arguments for a "pure" sports car magazine. While SPORTS CARS ILLUSTRATED stayed on a steady diet of just production machinery the magazine was close to foundering. Since that time and due to the introduction of modified cars, specials and hop-up techniques SCI has grown to become the world's largest selling sports car magazine and, in one year's time under present management and editorial direction, has gone from a financial position deep in the red to a solid black. Our circulation has more than doubled since the magazine's purchase by Ziff-Davis.

We can hardly bring ourselves to argue with success and the present formula seems to be just that. We're sorry that we haven't satisfied you but it would seem that you've been outvoted. – Ed.

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TECHNOTES

By KARL LUDVIGSEN

SURPRISE YOUR FRIENDS

Enclosed is a picture of an interesting car; notice position of rear-view mirror and steering wheel. It's not just another hot rod, even though it has turned 66 in the quarter with a stock V8-60 Ford in the front seat. During good weather it's used as regular transportation to work and club meetings as well as on rallies.

Dick Costello
Van Nuys, Calif.

FEED AND SPEED OF HEALEY

It seems that nobody wants to put down on paper much information about what fuel a man should put into his gas tank, but at least let me ask you this: Should the Austin-Healey 100 with its 7.5/1 compression ratio be operated on regular, premium or the new high octane gasolines? One reputable sports car garage that does considerable racing told me to use the next best thing above kerosene, their theory being that the British engines are not capable of withstanding the more powerful combustion of American gasolines. What do you say?

I'm now installing Michelin X tires on my Healey. Since they don't manufacture a 5.90 x 15 tire they recommend that I use their 165 x 15. They previously recommended the 155 x 15 but found that this made the car too low. If I do use the 165 x 15 can you tell me how much this will throw off my speedometer? Also, what would you suggest as a pressure for this tire for normal driving with an occasional long trip thrown in?

Henry F. Crocker, Jr.
Chester, Vermont

Your Healey should run perfectly well on all current Regular pump gasolines — not because it can't take the strain of higher-octane fuels (which, as stated, is ridiculous), but because better fuels are simply not necessary with that compression ratio. It may develop more expensive tastes if carbon deposits form, however. The cleanest-burning east coast gas you can use is Amoco Premium, which has the least lead of any pump fuel. This minimizes combustion chamber deposits and plug fouling. For a more complete discussion see SCI, April, 1957.

From data supplied by Michelin, it seems that your speedometer will read about 1.7 per cent faster than it now does if you make that change. This is because the new size is slightly smaller in section than the old. Hardly enough to worry about. Tire pressures with the X type should be very low by sports car standards. I think you'll find 22-24 pounds to be completely adequate and quiet in corners.

MG MILL REMOVAL

I'm going to pull the engine on my 1953 MG TD, using a ¾ ton hoist. I'd like to know where and how to disconnect the drive shaft. Should I remove the radiator? Are there any other difficulties I might run into?

Robb Moses
Cuba, N.Y.

Yes, you should remove the radiator first, and all small fuel and electrical connections. Then unbolt the exhaust pipe from the exhaust manifold.

Remove the clutch operating mechanism from the side of the sump. Remove the starter and carburetors. Then take out the seats, carpets, floorboards and toeboard. You'll now be able to take off the top cover plate of the transmission, being careful not to withdraw any of the selector shafts past the first stop. Cover the box to keep dirt out.

Now disconnect the forward U-joint flange, marking the adjoining faces so you'll know how to hook them up again. Disconnect and lift the steering column. It should now be possible to put a sling around the engine and lift it forward and up.

DEAD JAGS AND LIVE AXLES

I liked your write-up on the XK140MC (March, 1957 SCI). However the chart states that acceleration to 80 mph takes 18.8 seconds, while the quarter mile was covered in 16.9 seconds at a speed of 86 mph. Why the discrepancy? Also, just what is a "live" rear axle?

Tim Tredwell
Hamilton, N.Y.

We really slipped a cog on the chart for the XK140MC. The graph of acceleration and the statements in the text are okay. On the specification chart, however, the speeds "70" and "80" got pasted down opposite the times in seconds for 80 and 90. The time for acceleration to 70 (11.3 seconds) was left out, darn it, as was that to 100 mph (24.7). If you compare chart to graph you'll find this to be the case.

A live rear axle is the conventional axle type in which the differential, ring and pinion, axle shafts and hubs are all carried in one housing and all move up and down with the wheels. It's called "live" because it's subjected to all the drive shaft and wheel torque reactions, which in a hot car can make it a very live thing indeed! A "dead" axle is best represented by a de Dion-type axle tube, which locates and guides the wheels but isn't influenced by drive torques since the ring and pinion housing is bolted to the chassis frame. Any help?

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MARION'S MEANDERINGS

by Marion Weber

Hi, There! With the seasons, or something, we break out a few times a year and run a whole page of things . . . little grommets for your car, or your friends, or yourself. A lot of people have told us that this is a pretty handy way to be reminded of some item which is not ordinarily available except from specialized concerns, such as this, and they find the idea of being able to simply mark the gimmick desired, tearing out the page and sending it to me, c/o MG MITTEN, and then getting it back posthaste and postpaid very attractive. And, who can argue with this logic? Look at the time and money they save by not having to shop around . . . and, as you probably know, our firm has a 100% record of customer satisfaction or money back. You can order with confidence in our descriptions and prices. Try it today, eh?

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Part I

WHENCE COME THE HORSES?

1957 version of Ferrari-modified Lancia GP car has Solex carbs angled inward to give straighter line to intake valve. This is a must for proper ram tuning.

By KARL LUDVIGSEN, SCI Tech Editor

International formulas have made this the heyday of unsupercharged engines, and the top drafting-room boys have pushed their products past the mark of 1.9 horsepower per cubic inch and are reaching craftily for the magic figure of 2. The high water mark of 290 horses set by Mercedes in 1955 has finally been submerged by Maserati, who rates its latest V-12 at better than 300 horses from an engine of 2½ liters or 152 cubic inches. It won't race until the 1957 Monaco GP, but it's been breaking all records on the dyno.

On an out-and-out basis this is nothing spectacular, of course, since the final versions of the 91-inch BRM cranked out some 6.4 horses per cubic inch while working under a boost pressure of nearly five times atmospheric. Limited by the latest Grand Prix formula to 45 cubic inches, though, the supercharged engine is severely handicapped, and even at the BRM's fantastic level a bare 290 horses could be expected from that size. Blown machinery thus might be able to challenge current normally-aspirated engines on the basis of maximum output, but the necessary sacrifices would chop big hunks out of the rest of the power curve, and there are other drawbacks of complexity, weight, bulk and astronomical operating temperatures and pressures (The BRM's oil had to be happy at 284 degrees F!).

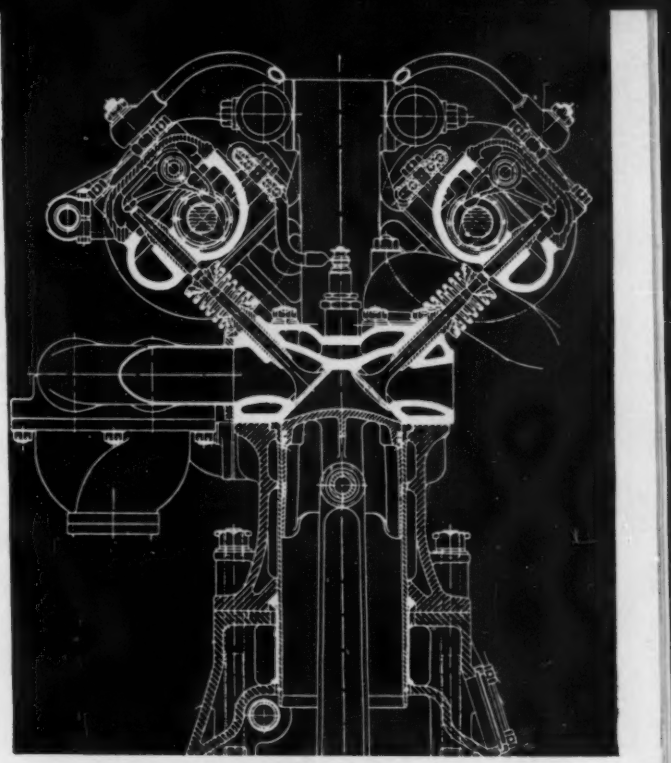
There are good reasons, then, for the almost unanimous swing to the unblown engine, but there have been equally good reasons in the past and some very fine engines produced as a result. It may seem ridiculous after the above to mention a horsepower per cubic inch figure of 0.72, which is the rough level of today's production engines. This was achieved, though, *in 1922*, on the gasoline of that day and the puny compression ratio of *5.8* to *1*. Only today are some of the techniques then used by Sir Harry Ricardo coming into wide understanding.

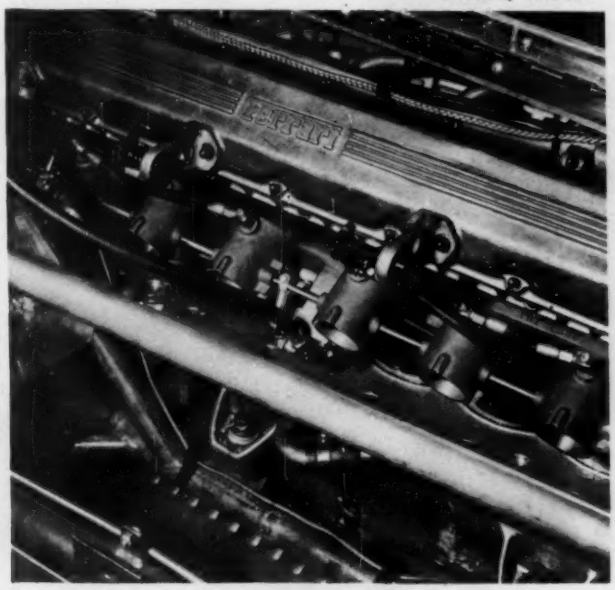
He pulled 129 horsepower from his 180-cubic-inch Vauxhall four-cylinder racing engine, largely by dint of detailed attention to breathing and efficiency. These are the points that are paying off almost a quarter century later, and while there have naturally been many other advances in that time, Ricardo's basic outlook remains as clear and logical as it once proved itself to be. One of the most important lessons from his work is that the whole top end of an engine must be thought of as an integrated system, rather than as an assembly of otherwise unrelated elements. This should be kept in mind when reading a discussion, as following, of the different points that contribute to horsepower.

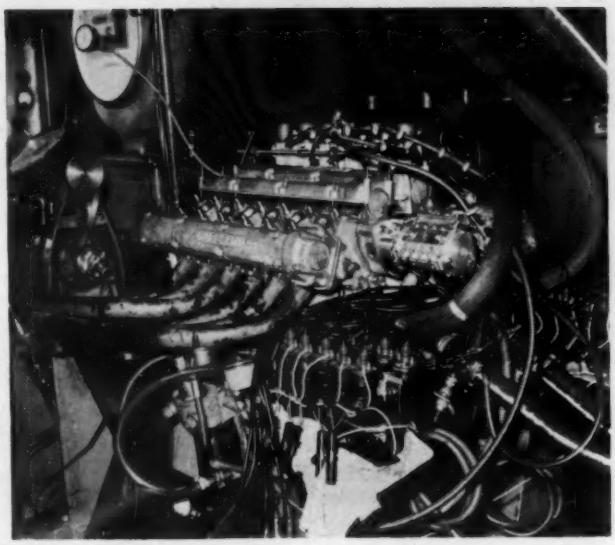
We also might mention again that we're only worried about relative values of horses *per cubic inch* here. If you want to up the inches that's your privilege, but for the

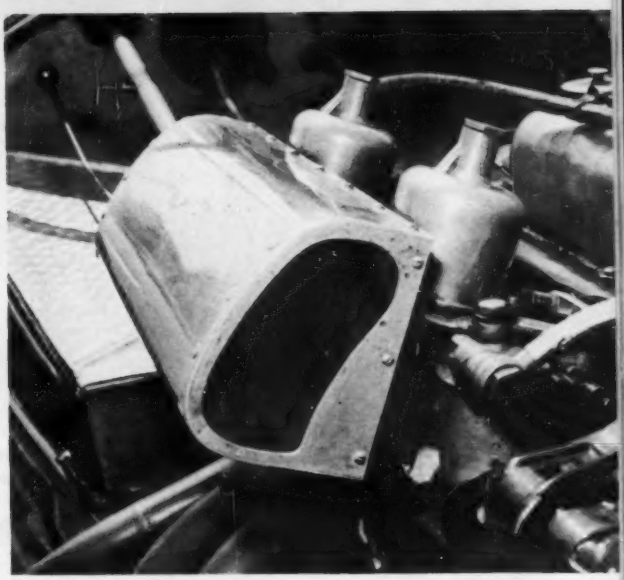
At RIGHT is cross-section of Harry Ricardo's 1922 design for Vauxhall four-barrel racing engine. He pulled 129 horses from 180 inches in spite of primitive compression ratio and fuel. Techniques used — valve gear and port design, cooling water flow — are now being fully used. BELOW is example of how NOT to do it. 4.4 Ferari six was good sports car engine, and Hilborn injectors are good for Indy, but combination in 1956 Bardahl-Ferrari failed for lack of ram tubes. Story tells why.

Photo by Wilson









At LEFT is incredible new Maserati V-12, for which two horses per cubic inch are claimed — unsupercharged! 24 coils, condensers, breakers used to avoid ignition trouble on dyno, are unlikely to appear. Simpler MG engine ABOVE shows use of mild carb ramming box which feeds mill with cool air. Third part will discuss headers here.

moment we, like the Europeans, are concerned only with getting the ultimate from what we have. The same problem is dominant in sports car class racing, and both sports and Grand Prix cars now reveal enlightened use of some quite advanced concepts. Darn few of them are directly applicable to current production machinery, but the thinking that's behind them definitely applies.

FRAMEWORK

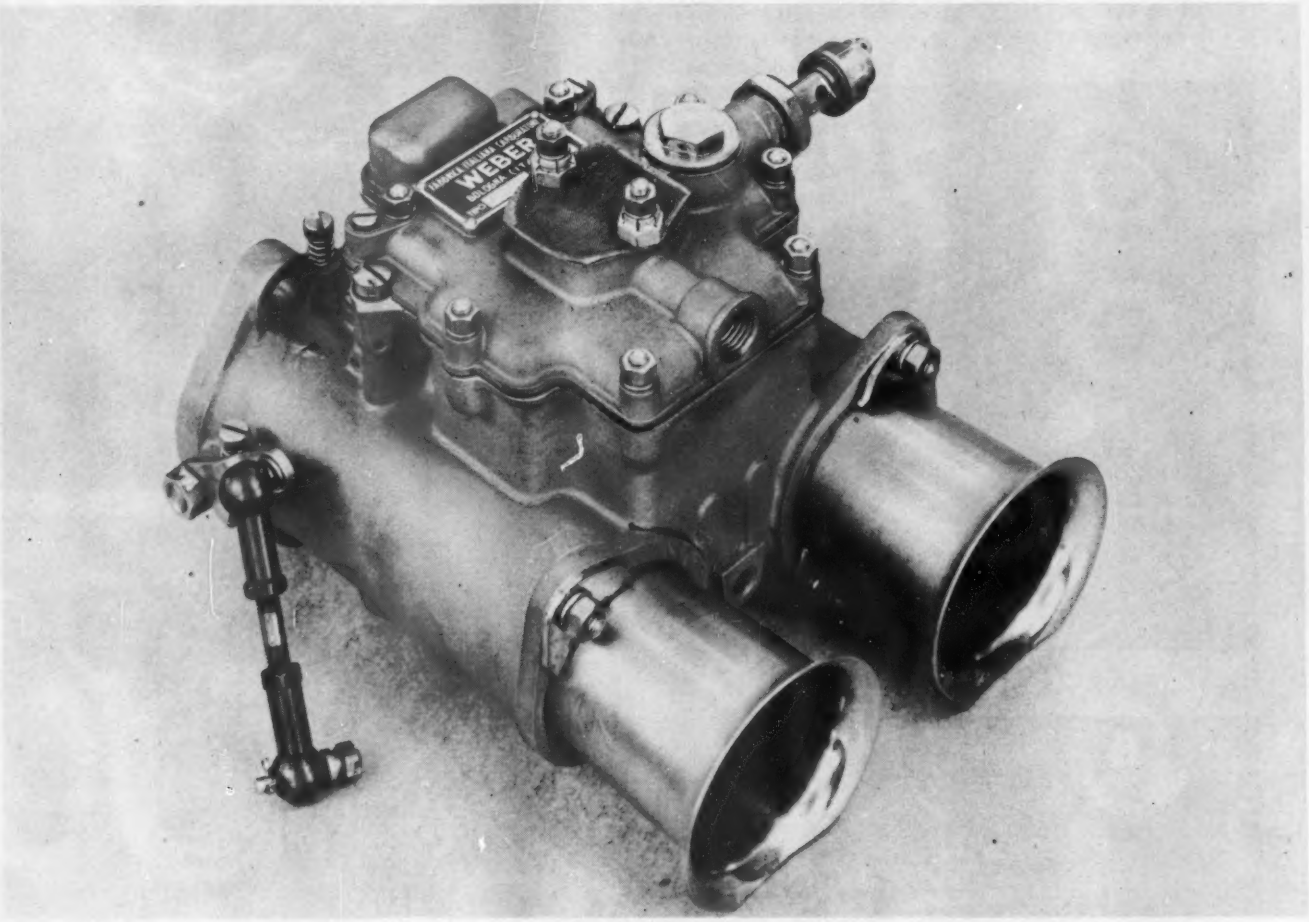
Assuming a constant displacement, horsepower depends roughly on the average combustion pressure, the piston area, and the piston speed. Nowadays basic stress limits of materials and bearings have tended to level off piston speeds around 3500 to 4000 feet per minute for racing goods, in contrast to the 2500 figure still respected by production designers. If piston speed is thus limited, the piston area can be enlarged by shortening the stroke and going to higher rpm levels. To avoid excessive bores and piston weights the next step is usually more and smaller cylinders. As a result the current GP engines range from grossly oversquare fours through slightly oversquare sixes to roughly square eights. We keep hearing reports of twelves about to burst into Grand Prix, and by the time this appears some of them will have done so. They'll have to be good, though, to offset their extra complication and weight. In his 3.5 liter sports cars Ferrari has made a notable switch back to twelves after a long series of Lampredi fours.

GAS VELOCITY

The mechanical framework having been resolved through

They're pulling better than 300 bhp from 150 cubic inches - - Here's how it's being done.

Photos by Mathews



In spite of the best efforts of the world's fuel injection designers, this neatly crafted carb by Weber is still one of the best ways of feeding an engine with plenty of fuel and air. Its float bowl layout also avoids starving on turns.

compromise, attention turns to the boosting of combustion pressures, which are a function of compression ratios, the weight of air consumed, and the proper proportioning of fuel to that air. Supercharging is the easy way to step up the pounds of air per minute, but without it careful study is necessary to increase this value, and, as we will see, to keep the compression ratio high at the same time.

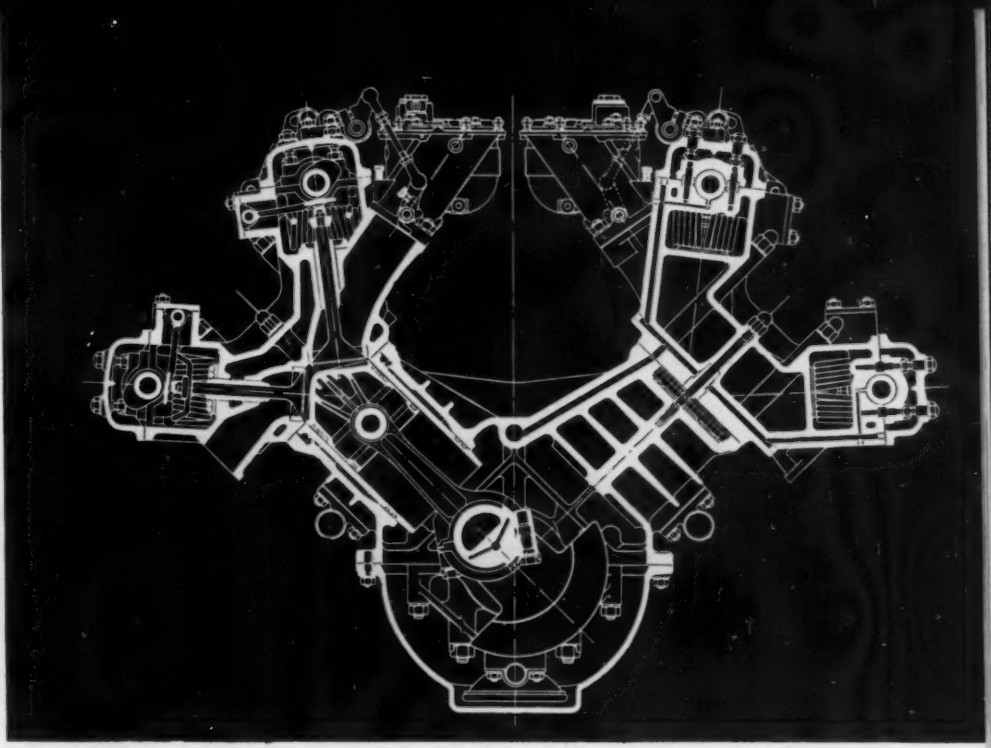
As we follow the path of air through the engine, a preliminary problem pops up in getting it to the intake ports and fuel supply equipment. The most extreme method ducts it in through a forward-facing scoop so placed as to force air in at high road speeds. Bristol Motors have experimented a lot with this both on the bench and on the road, and like others they feel that the very slight edge obtained over 100 miles per hour isn't worth the complication and tuning problems. Generally designers are happy if they can supply the engine with cold air, which has more weight per unit volume than the hot air under the hood. Most ducting is now done with that in view, and some like Bristol and the late C-Jags baffle their air boxes to insure equal distribution of any pressures that may exist. Commonest, of course, is the hood air scoop, which is ideal for V-type engines.

As you know if you've done any advanced engine tuning, theory can help a lot in intake port design but cut-and-try methods must set the final layout. To go back to theory, as Ricardo did, a given combination of engine speed, cylinder volume and port diameter will produce a certain speed with which the air flows through the intake ports. The velocity goes up for a given engine size as the revs rise and the ports are made smaller, the exact relation being as follows:

$$\text{Nominal gas speed (feet per second)} = \frac{\text{Volume of one cylinder (cc)} \times \text{RPM}}{\text{Port diameter (ins)}^2 \times 4630}$$

This formula assumes that each cylinder has its own separate port, which is the only way to build a racing engine. We'll leave the siamesed ports and convoluted manifolds to the production penny-pinchers.

Ricardo found that gas speed had a very direct effect on volumetric efficiency, which is actually only the technical term for the percent of cylinder filling that we're looking for. His experience has been backed by modern findings and

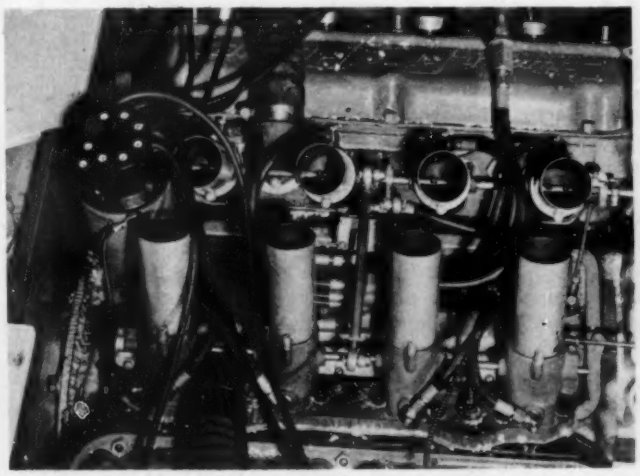


Section of Lancia D50 racing V-8 reveals big intake port of constant diameter, wet cylinder construction and rugged four-bolt main bearing caps. Valve gear uses finger-type followers, long radius minimizes rubbing on stem, plus hairpin springs to close thick-stemmed valves. Carbs shown would have been good but had to be specially made. 1954-55 editions had vertical Solexes, causing kink in incoming air column. See latest version on page 14 as set up by Ferrari.

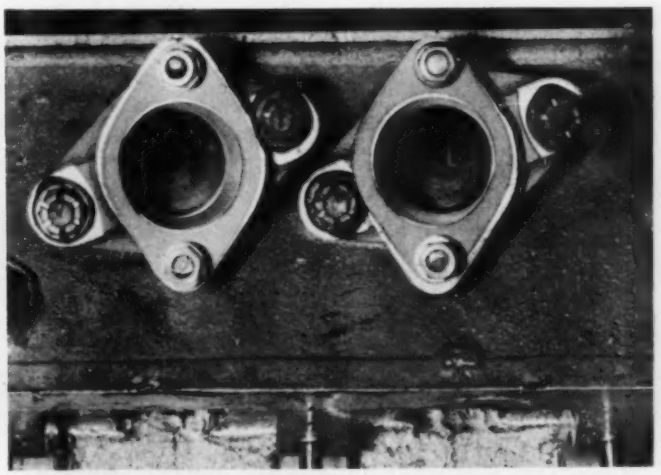
states that gas speeds should not greatly exceed 150 feet per second for best results, and that the maximum allowable should be 200 fps. With the above formula it's possible to set the speed desired for an engine and calculate the port size required.

Running 58 mm Weber carburetors, the Ferrari Type 553 four-cylinder GP engine was reputed to be exceptionally efficient at 5000 rpm, which works out to be a gas speed of 129 feet per second; well within our limits. Similarly, even when taken to 8000 the late Mercedes GP straight-eights had gas speeds of only 154 fps in their 1⅞ inch intake piping. In contrast, the ports behind the two inch intake valves of the Alta GP four keep the velocities up around 240 feet per second at peaking speed of 6400 rpm. This constitutes a basic restriction on the engine's output which can't be bypassed by superficial methods. Useable carburetor size is held to 48 mm (as fitted to these engines by Connaught Engineering), since any larger size would pass no more air and would only impair vaporization and mixture correction. The Alta compares closely with the early Type 625 Ferrari engine, which shares the same dimensions (94 x 90 mm), the same rough valve layout and port sizes and carries 50 mm Webers.

(Continued on page 47)



This is the RIGHT way to deal with Hilborn injectors, as demonstrated on a Chrysler. These twin-rocker-shaft heads are well suited to the techniques discussed here. Use of ram tubes or "stacks" makes best use of straight path offered by venturi-less injector bodies.



Intake ports here of 150S Maserati engine give clear view of protruding valve guide and valve seat. Port in this case is cleaned up and guide later inserted. Also guide can be ground off even with surface, or port built up to streamline flow around protruding guide.

SCI ROAD TEST:

Clean, straight forward lines of Golden Hawk are kept free of excessive bright work. Hood louvers, barely visible, are simulated. Windshield has good tilt—better streamlined than blunt wrap-around.

The Studebaker Golden Hawk

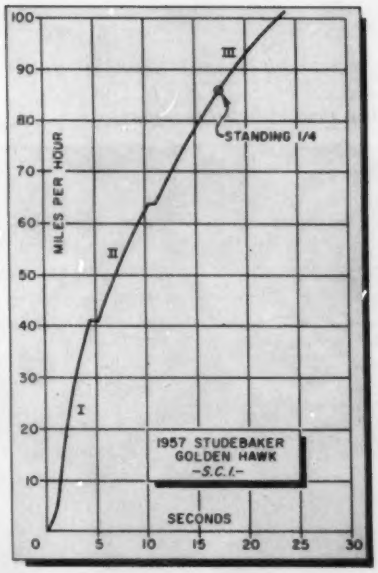
Photos by Joe Petrovec

Simple, attractive, Italian grille work fits neatly into design. Raised center section of hood could be cut into for air scoop.

WITH THE EMPHASIS this year on quality, craftsmanship and power, the Studebaker Golden Hawk takes its place among the upper echelons of the more distinctive machines of America's assembly lines. Its former reputation for loose construction and ill fitting appointments is a long way behind it. The bodywork, tastefully designed under Italian influence, has a meticulously hand-finished look, and a solid feel on the road. And all this is not just a matter of chance, but a matter of choice. According to Studebaker-Packard President Harold Churchill, a concentrated effort was made on quality rather than on quantity. Volume was cut, and the savings of this measure were put into the careful construction of each individual vehicle. The result is gratifying—with every car a complete package, and no loose ends anywhere.

Compared to its sister products, the Golden Hawk is longer, lower, heavier, finned and supercharged making it the "select" car of the entire line. And any similarity between the Golden Hawk '57 and the Golden Hawk '56 ends abruptly with the name. This year's gilded bird cruises at 80 mph, takes turns fast, can accelerate from 60 to 100 in 13.2 seconds, and affords comfort to all passengers. What's more, all this comes as a stock package—that is, all the little power items which are listed as optional on most cars come delivered as standard equipment. In these days of power packages at cost plus prices, the GH is a rare bird.

SCI's test Golden Hawk came equipped with a three



Here's a good example of the featured twin-traction differential as it gives both wheels equal dig in soft beach sand.

Going in twelve different directions. Breakaway was caused by belting pedal mid-way through tight turn on drenched pavement.

speed transmission with overdrive, an automatic hill holder, a radio, a heater, a twin-traction differential, and heavy duty springs fore and aft. As such, except for the heavier springs, the car sells for $3379 F.O.B. New York, including pre-delivery preparation. This *didn't* include power brakes or steering.

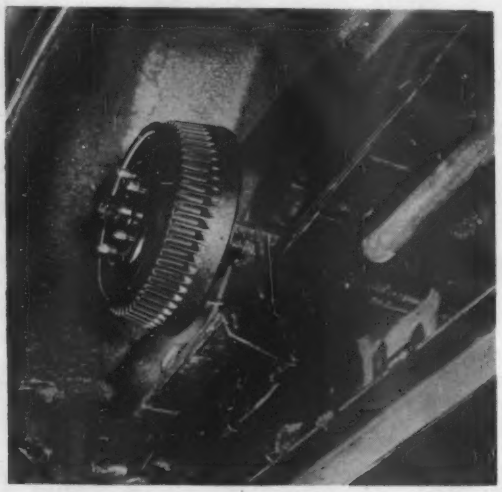
Most of the idiosyncrasies peculiar to its predecessors were inherited by the new Hawk, and the resultant problems were passed as part of the legacy to the present engineers. They did with what they had, and what they did with it, they did well. Every change, every alteration was a benefit, and this became more obvious each day we had the car.

Front suspension remains much the same as last year with two unequal length wishbones, the lower of which is pressed steel. The only change here is in the spring dish of the lower arm which was modified slightly to accommodate a new shock absorber mounting. The rear remains the same also, with the rear of the semi-elliptic spring mounted under the frame, and the front shackled outboard. Shocks at the rear are Gabriels, and mounted in sea-legged fashion. In this way, the soft ride is maintained while curbing the sideward motion of the car in turns.

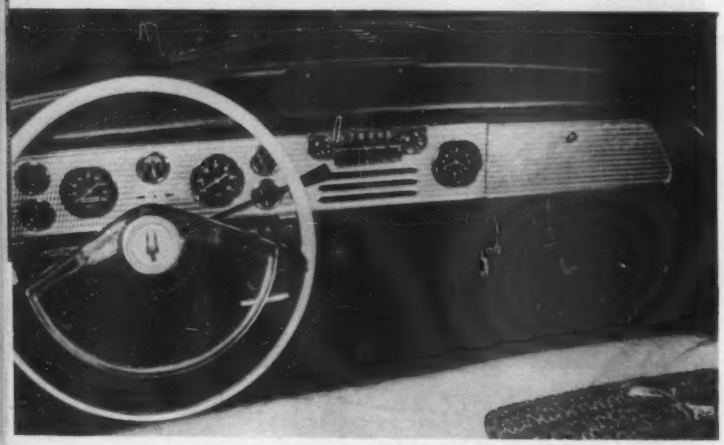
Great things were expected of the 1957 Hawk, then, but when we first tooled it out into traffic we nearly sideswiped a few innocent Hillmans before we got it pointing straight. "Shades of last year," we murmured, "Better check the tire pressures." They were well below the recom-

Shallow trunk is given more room by the high contoured deck-lid. Spare wheel, of course, takes up a third of the space.

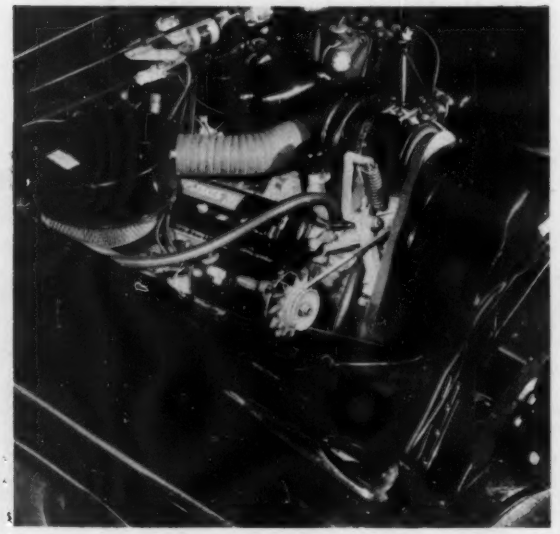
High fin improves rear looks — adds some stability.



ABOVE: Finned drums helped cooling quite a bit. Brakes at rear had locking tendency. Springs on test car were beefed up.
BELOW: Instrument grouping is good, but low. Speedometer is awkwardly calibrated in 20 mph graduations.



Engine compartment is cramped, and loaded for bear. To left of blower is spring loaded belt tensioner.



mended 26 psi front and 24 rear, so we took them on up to 32 front and 30 rear. This naturally made a world of handling difference at the expense of the ride. It was worth it since (a) the heavy-duty springs already gave a stiffer-than-normal ride, and (b) the Hawk's stability was revealed to be of a very high order indeed.

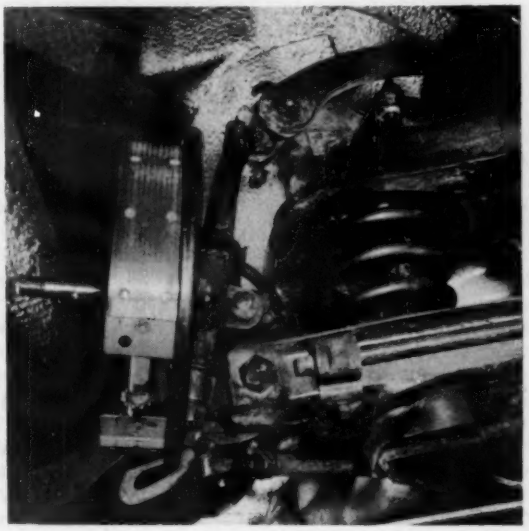
You can now feel four wheels on the road and can place and balance the car with accuracy more characteristic of a Corvette than of a five-seater coupe. It's no sports car but in our steadily-rising American frame of reference it's a capable "Gran Turismo" machine. Thanks to weight distribution, front anti-roll bar, etc. the Hawk understeers a lot and without power steering takes real muscle to bend it hard off a straight line. When taken to the limit we were pleased to find that it was the rear end that broke away, though, and the surplus power, stiff springs and special differential made this a workable proposition.

Flat out on top speed runs the Golden Hawk flew straight and true with no tendency toward wander or lightness. This was thanks again to the strong understeer characteristic.

Through tight, slow corners there was some inclination toward lean, but only at the upper limits, thanks to the heavy-duty springs and the sea-legged mounting of the rear shocks. Rear-end breakaway could be provoked in these corners by stabbing the throttle hard mid-way through the turn. A good yank on the wheel quickly corrected the slide. Breakaway was induced several times at several speeds just to see how far we could go. This was done in four successive passes by increasing the speed each time, and each time we came out unscathed. The twin-traction differential held us right there, until the power exerted on the rear wheels slipped them both out of track, and momentum carried us to the outside of the corner. We also tried this on wet roads, and we don't recommend it for anybody.

On long, fast turns the rear followed the front and the car stuck to the surface. Even on wet pavements the car held well, but then, discretion precluded further attempts at provoking breakaway. Tire squeal was slight especially with the added pressures. Some pitching on the straights was noticeable, but in general the ride was flat, and reaction of the car to bumps became predictable upon better acquaintance with the vehicle. More equalized damping would have suppressed some of the after-bounce oscillation of the heavier springs which was very slightly detectable.

Front running detail shows conventional Studebaker setup. Brakes are Wagner Lockheeds with single leading shoe.



The twin-traction differential works like a charm, selecting the side which is most in need of traction. It held us in the corners, lessened wheel spin on bumps, gave us excellent tracking qualities, and insured high speed stability. For the small cost of $35.00 it doesn't pay to be without it.

The powerplant in the Golden Hawk is the same as that in the President models except for two slight changes. One is the mounting bracket for the supercharger, and the other is the low compression head—7.5/1 or the optional 7.0/1. The induction system consists of a single-stage centrifugal-type variable-ratio supercharger, a Stromberg, two barrel carburetor, and a carburetor air chamber.

The McCulloch blower itself sits on the special mounting bracket in the V of the engine, and is belt driven from a pulley on the crank-shaft. As Roger Huntington pointed out in his *Supercharging The Right Way,* (August 1956 SCI) the McCulloch incorporates the unique peculiarity of delivering boost automatically when needed, and merely idling along at cruising speeds for economy.

The engine fired up without too much fuss, but with a few excessive spins of the crank. During fast idle, there was some "hunting" from the engine, which cleared up after things warmed up a bit and the fast idle kicked out. In cruising range, the engine loafed at eighty, made very little noise, and revved at a modest 3000 rpm. But when it was time to get around the Sunday-go-to-meetin' pokey, a stab at the throttle bar released all the patiently waiting potential, and all sorts of things happened simultaneously. The kick-down switch threw out the overdrive, the blower raised its pitch, the limited slip differential selected the wheel with the best traction, and all at once some unseen force slammed us in the sacroiliac, and what once loomed ahead became only a dim reflection in the rear-view mirror.

The clutch by Borg and Beck with a woven asbestos lining disc felt neither stiff nor spongy, but firm enough to make even urban driving pleasant. The box had a conventional shift pattern with the overdrive cable located to the left of the driver under the dash panel. Lever travel distance was moderate, and the synchromesh on second and third gears was unbeatable. Overdrive was automatic, coming in at about 40 mph. It gives a few extra ratios which are handy for some road conditions, but we did all performance testing with the unit locked out.

(Continued on page 66)

TEST CAR: 1957 STUDEBAKER GOLDEN HAWK

PERFORMANCE

TOP SPEED:

	In overdrive
Two-way average	118.5
Fastest one-way run	120 mph.

ACCELERATION:

From zero to	Seconds
30 mph	3.1
40 mph	4.4
50 mph	7.1
60 mph	9.3
70 mph	12.4
80 mph	15.5
90 mph	18.7
100 mph	23.3
Standing ¼ mile	17.3
Speed at end of quarter	86 mph.

SPEED RANGES IN GEARS:

	Std.	O.D.
I	0-40	0-55
II	5-64	5-90
III	13-106	13-Top

SPEEDOMETER CORRECTION:

Indicated	Actual
30	29
40	39
50	48
60	57
70	67
80	77
90	89
100	100

FUEL CONSUMPTION:

Hard driving	11.1 mpg.
Average driving (under 60 mph)	15.3 mpg.

BRAKING EFFICIENCY:

(10 successive emergency stops from 60 mph, just short of locking wheels):

1st stop	70	6th	63
2nd	69	7th	60
3rd	67	8th	58
4th	67	9th	57
5th	65	10th	48

SPECIFICATIONS

POWER UNIT:

Type	V-8, Supercharged
Valve Arrangement	ohv, in line
Bore & Stroke (Eng. & Met.)	3.56 x 3.63 in. (91 x 92 mm)
Stroke/Bore Ratio	1.02/1
Displacement (Engl. & Met.)	289 cu. ins. (4720 cc)
Compression Ratio	7.8/1
Carburetion by	2 barrel Stromberg (WW 6121)
Max. bhp @ rpm	275 @ 4800
Max. Torque, lb-ft @ rpm	333 @ 3200
Idle Speed	450 rpm

DRIVE TRAIN:

Transmission ratios	
Rev.	3.154/1
I	2.49/1
II	1.587/1
III	1/1
Overdrive	.722/1
Final drive ratio (test car)	4.27
Other available final drive ratio	3.54, 3.73, 3.92, 4.09, 4.55
Axle torque taken by	Rear leaf springs

CHASSIS:

Wheelbase	120.5 ins.
Front Tread	56.7 ins.
Rear Tread	55.7 ins.
Suspension, front	Coil spring, wishbone
Suspension, rear	Leaf — heavy duty
Shock absorbers	Tubular
Steering type	Cam & single lever roller stud—Ross
Steering wheel turns L to L	4-2/3
Turning diameter	41 ft. left, 40 ft. right
Brake type	Wagner self-center, self energizing, ribbed drum
Brake lining area	195.25 sq. ins.
Tire size	7.10 x 15

GENERAL:

Length	204 ins.
Width	71.3 ins.
Height	55 ins.
Weight, test car	3550
Weight distribution, F/R	57.6/42.4
Weight distribution, F/R, with driver	57.2/42.8
Fuel capacity — U.S. gallons	18 gals.

RATING FACTORS:

Bhp per cu. in.	.951
Bhp per sq. in .piston area	3.48
Torque (lb-ft) per cu. in.	1.15
Pounds per bhp — test car	12.9
Piston speed @ 60 mph	1768 fpm
Piston speed @ max bhp	2904 fpm
Brake lining area per ton (test car)	110 sq. ins.

SKULL BUSTING FOR SAFETY

Fragmented helmet is result of actual fatal accident. Temple area is most vulnerable part of skull.

By GEORGE G. SNIVELY, M.D.
Director, Department of Medicine
Sacramento County Hospital

Editor's Note: We hesitated before committing the following article to type. Our reasons were several. For the first part, Sports Cars Illustrated does not deal in sensationalism and Dr. Snively's report is probably the most sensational article ever to appear in an automotive magazine. Secondly, this vital research is bound to provoke a storm of protest similar to that which followed the roll bar regulations. Finally the manufacturers of the helmets concerned might not take too kindly to the publication of the data contained herein. However facts are facts and the following report is the result of tests conducted under the most carefully controlled scientific conditions possible, not on dummies but on the human heads the helmets were designed to protect. Further, to give credit where credit is due, the helmet manufacturers concerned have virtually all gone into emergency operation to revise their products to correct the faults found by the tests. With the above in view, SCI is proud to present what may be the most shocking article you've ever read. —jpc

A DEDICATED group of people in Northern California have been stirring up a storm in an attempt to catch up with the British. Not, as such a statement often implies, in an attempt to build a "backyard bomb" to compete with foreign sports cars on the road racing circuits, but in the less dramatic and more important effort of making the use of these road racing circuits safer for the driver.

Less than a year ago, one of the most popular sports car drivers in Northern California died in a race accident, due to head injuries resulting from the failure of his helmet to give adequate protection. This helmet was one of the most widely used brands to be found at a race course, and the initial reaction to this accident was to accept it as "inevitable." The Technical Committee of the San Francisco Region of S.C.C.A. however, was blessed with a chief who makes his living as an attorney, and his legal training and background made the investigation of the helmet failure more than a cursory affair.

It was quickly realized, during this investigation, that there was no worthwhile data to be easily found on "just what is a safe crash helmet", and that the technical specificiations which were available for the competency of a helmet were sadly inadequate.

Meanwhile, as a tribute to the driver who had been killed, the San Francisco Region established the Pete Snell Memorial Fund; the trustees of this fund decided to dedicate it to the study of crash helmets, and to the development of standards and tests which might be applied to make such headgear better.

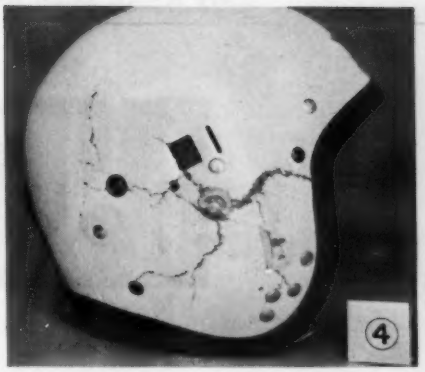
All of those concerned recognized the impossibility of perfect protection of the head under all circumstances possible in racing accidents. It was felt despite this, that if

Photography by Houston Walsh

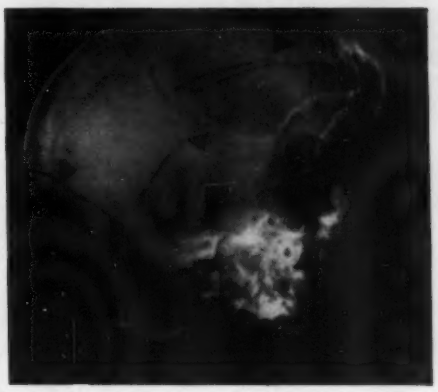
Bell helmet, now in process of revision, had stronger shell than others, but liner allowed shock of impact to cause minor skull fracture.

Resilient liner material of the Bell helmet proved insufficient in absorbing shock after shell cracked. Result: Single linear fracture of skull.

Gentex helmet is also being changed. Wingnut, bolt, and wooden stop for visor allowed concentration of impact to shatter shell. AT RIGHT: Severe skull fractures occurred upon impact.



Cromwell helmet looks undamaged. Shell remained intact, but resiliency of liner afforded no protection to head. AT RIGHT: X-ray shows severe fractures due to inadequate protection.



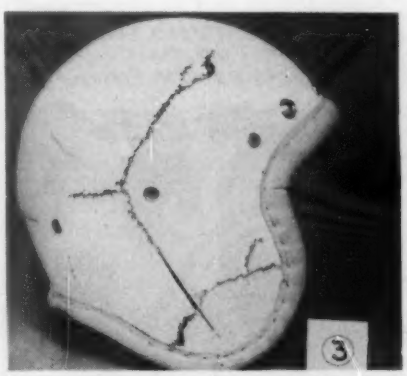
a crash helmet was worth wearing at all, a premise which now even the most daring of racing drivers accept, it should be one designed for maximum protection, not one built merely to protect against uncomfortable bumps.

Very early in this study, perhaps the most startling finding of all became sadly apparent. Almost none of the people concerned with the use, manufacture or sale of helmets in this country had any worthwhile, scientific data concerning a helmet's efficiency. The prevailing methods of selection by the driver seemed to be based upon cost, or appearance, or superstition, or the fact that the driver had a friend "who rolled his machine 11 times at 130 miles per hour at the Bent Cup Races, and he lived through it!" The manufacturers, by the same token, almost without exception, were either unfamiliar with any testing procedures, or used methods of so-called testing of extremely dubious value.

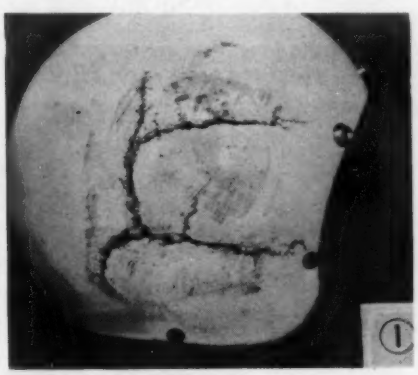
The "Tes[illegible]al" type of test deserves special mention. Even brief consideration reveals the vast number of completely uncontrolled variables involved in any accident. The magnitude of impact forces, angles of contact, degree and duration of contact, acceleration of the head, relative mass and density and resiliency of the impacting objects—all these are factors of great importance in determining the results of an accident, but in most accidents are virtually impossible to determine, and indeed are usually not even considered. Perhaps with a team of physicists and engineers, armed with high speed motion picture cameras set up at different angles at the site of an accident, useful information about helmet protection might be gained, and some of the variables eliminated. This sort of set-up will not likely be found at a race track however, and in the absence of such analysis, the "accident testimonial" is dangerously misleading and patently worthless.

Despite this appalling lack of generally available knowledge, it was found that there have been well-designed, scientific testing programs in existence for some years. Of

(Continued on page 48)



Anderson helmet. Body of shell too weak to withstand sudden impact. Fragmented shell now unsafe for further use. Resilient lining is insufficient.



McHal helmet. The shell is strong enough to resist fragmentation due to abrasive impact. Resilient lining is springy, does not absorb shock.

Toptex helmet was best of those tested. Lining is non-resilient, crushes upon impact, absorbing force of blow. Strap and fastener not too adequate.

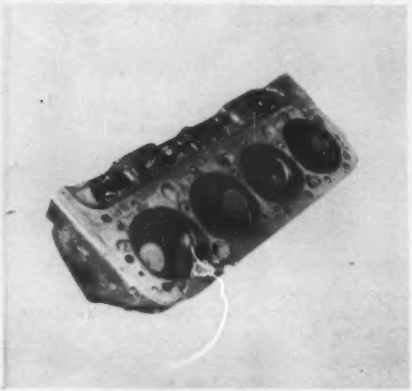
By KARL LUDVIGSEN, SCI Tech Editor

EVERYBODY

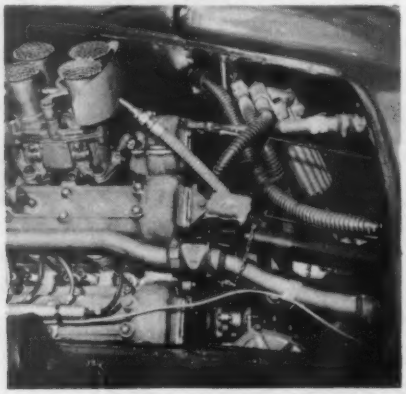
Since death of Castellotti, young Luigi Musso AT LEFT is top Italian driver. He pressed on in vain for Ferrari at Sebring while Fangio, ABOVE, tooled 4.5 "Bazooka" Maserati to easy win. Combination looks unbeatable in '57 sports car grinds.

but it was stopping power as well as go power that made the difference at Sebring.

Special aluminum head for SS Chev was tried in practice, discarded due to deflection and overheating. Ports and valves stock shape but bigger.

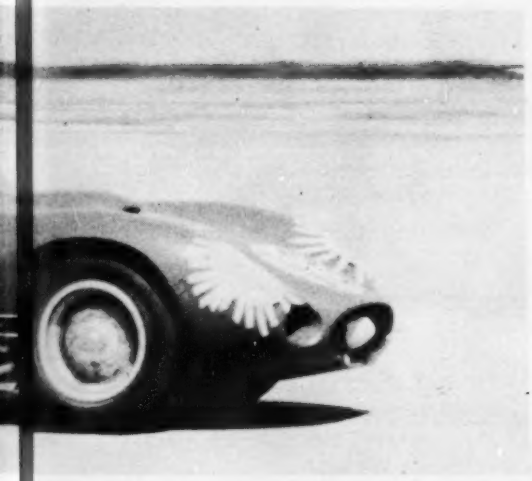


Ferrari 3.8 V-12 car has split water radiators divided by oil cooler. Oil piping and big filter are rugged. Twin plugs and Solex carbs fitted.



Amoratti, left, and Tavone get word from Collins after early Thursday practice run. Trintignant, was hastily imported by Ferrari.

HAD POWER



BY universal agreement Sebring is the roughest road course in the world. The acceleration requirements are those of a series of drag strips laid end to end, and on brakes it's as tough as five Le Mans races in just half the time. Designers and team managers hate it while the drivers don't much care. Its corners are either so tight that you poop around (there are five of these) or so fast that it doesn't make much difference. Between each slow one the fast machinery steams up over 100 and back down again, which is a lot of work five times in a 3½ minute lap.

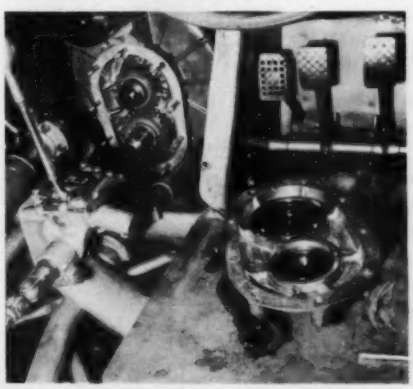
Unfortunately this means that neither good roadholding or good driving have a chance to show up really well at Sebring. There's a reward for sharp, persistent driving, and the Class A pilots can make time on the faster bends of the airport section, but generally the course is easy to learn. Sheer power and lasting braking make all the difference as is well shown by this year's finishing lineup. The order by makes was Maserati, Jaguar and Ferrari, with Chevrolet calling for special mention for the SS project. This was about the way it looked after practice too, providing the 4.5 liter Maser held together, but the big surprise was the failure of Ferrari to make a solid showing after their easy win in 1956. We can check over each make as to power, brakes, handling and race strategy to see just why this was so.

The most-feared weapon was in the Maserati camp, and it turned out to be unapproachable in the race. The feat of producing the first new 450S model for practice in the Swedish GP of late '56, leading until breakdown with it in Argentina, and then winning Sebring with it in March shows that the Maserati design staff is really back on its feet again for the first time since the war. From the standpoint of sheer power output this new V-8 is probably the fastest sports car the world has yet seen. Having driven the 450S in Argentina, ex-300SLR-driver Moss can talk of nothing but this car. In Buenos Aires he braked way early, used 6300 revs instead of the limit of 7000, and still had six seconds a lap over the competition. Moss set the lap record there at 3:36 with the 3-liter, but was sure he could do 3:29 with the 4.5. Retirement in the Argentine was caused by the loss of a small pin in the clutch throwout mechanism which rendered this important component unusable and led to the disintegration of the final drive. Needless to say, this had been corrected for Sebring.

Production of this new V-8 wasn't difficult, since it's based on two four-cylinder blocks from the well-tried and rapid 2-liter sports car (see SCI, May 1957), with a fractionally bigger bore and a much longer stroke to bring it up to 4.5 liters. Since the 200SI turns out 190 horses, a 4-liter V-8 based on it would be good for 375 or so — which means 400 bhp for the gas-fuelled 450S isn't hard to believe. Power comes in at about 2500 and goes right on up to 7000 safely. Backing up this juggernaut were two of the thoroughly-proven 300S models which themselves have proven capable of winning races in the hands of Fangio or Moss. With an older valve gear design they rev only to about 6700, and are rated at 260 bhp. In practice for Sebring, Moss complained that the 3-liters were slow out of the corners, possibly due to too-rich mixtures, and that he was losing two seconds a lap for this reason. This was improved by race time, but the 300S' were never pressed to the wall during the race. Just in case, they also fielded a 2.5 which was essentially an old reworked 1½ liter sports car. A practice hack, it had been thrashed extensively in Argentina.

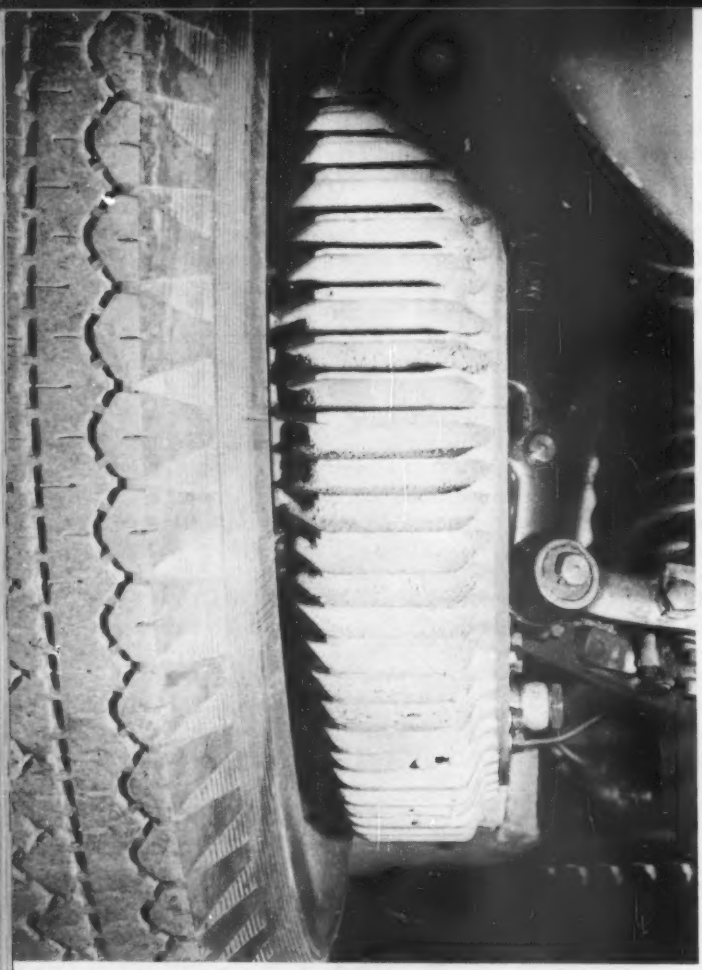
Biggest news with Jaguar was the new 3.75 liter engine which uses a brand-new block casting and special pistons. The origin of this goes back to Alfred Momo's hot-rodded D-Types, which SCI reported on in February, 1957. Momo

Cog-swapping in Maser V-8 made easy by drop gear-set behind clutch housing. Gears are bathed by engine oil spray from left of nine-stud box.



At right is original slipper-type '55 factory Jag piston, beveled crown. Center is JE slug used by Momo, left is new 3.75 lit. factory piston.

Ex-Ferrari man Ugolini examines times atop pits on Friday, determines Maserati destiny. Co-winner Behra apparently learned his lesson well.



In one picture, this is the story of Sebring, 1957. It's the huge new front brake developed to stop the fast and weighty 4.5 Maserati, but it's seen installed on the second-place Moss/Schell 300S. This car had more braking power and durability than it could ever use, and had no trouble taking second spot at the eleventh hour. All the Maseratis used Pirelli racing tires, which are ostensibly out of production. Using up stocks, yes, but what next?

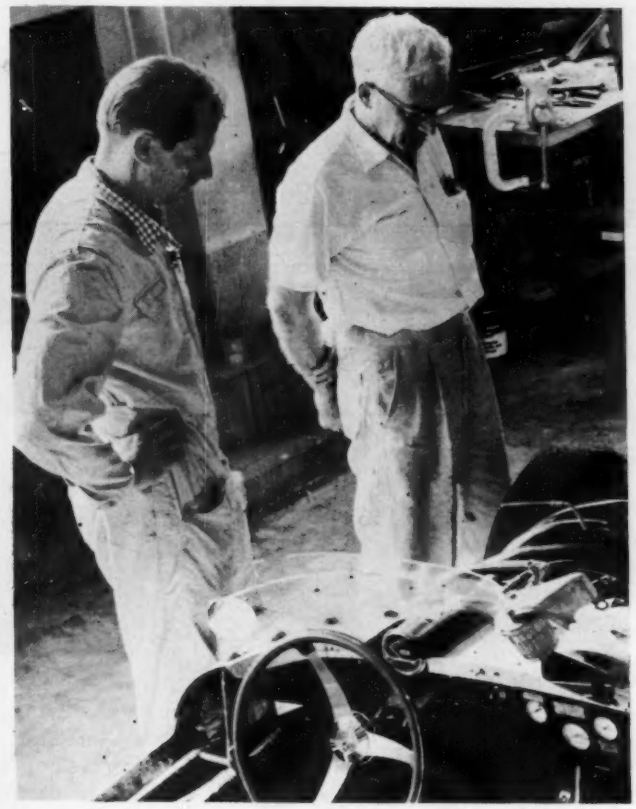
Here aiming for pit apron, champion Indy handler Pat O'Connor found Ensley's D-Jag to his liking; put in some of best Jaguar times. This car was hastily assembled at factory after fire destroyed D originally slated for Ensley. Torsion bars were set to suit Pat's technique.

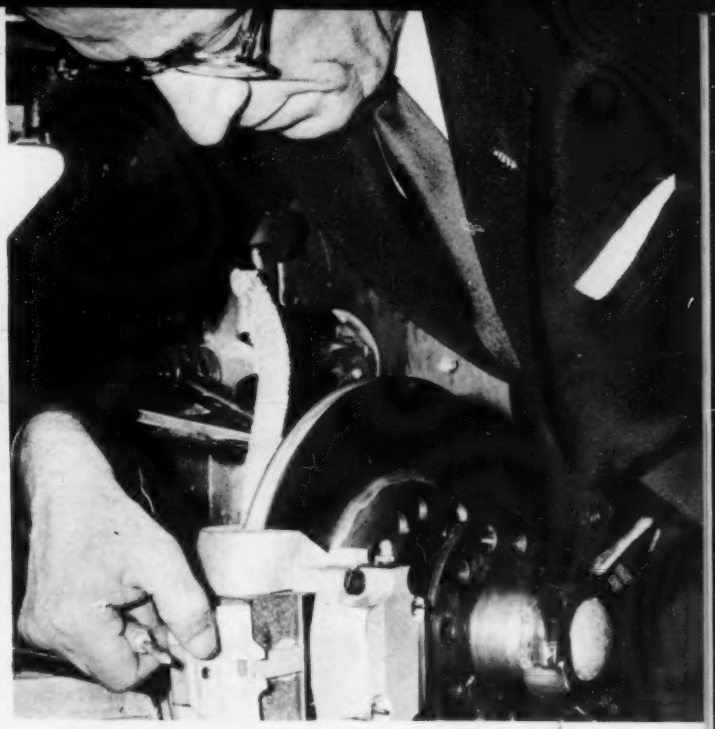
bored out several Production D blocks to 3810 cc, using JE pistons, and these cars were so successful that the factory asked for an engine to try out. It went so well on the Coventry dyno that over the winter a new pattern was fashioned and an official 3780 cc Jaguar was born. With the old-type head and Isky XM-2 cams, the US-built 3.8 delivered about 280 horses, and the works 35-40 head raised this to 295 on the factory-prepared engine. With Lucas injection the #5 factory car could probably command 310 bhp. This machine was completely prepared in England, and arrived on the boat with Hawthorn, Bueb, Lofty England and a factory mechanic. Cars 6 and 7 were readied in New York by Momo, with the exception of the "new" engine and the brakes, about which more later. Aside from the dropped valve (overrevving?) by #6 just after the start, the 3.8's ran like trains and had deep rasping exhaust notes which never faltered. Since the usable revs were if anything lowered by the boring job, the carbureted cars continued to use 45 mm Webers, different jets being the only change.

Ferrari power was extracted from two types of 60 degree V-12's, there being two cars of each variety. An eleventh-hour bombshell was the information that the two twin-cam cars were 3.8 liters and not 3.5 as listed. These engines are brand-new for '57, having two chain-driven (Lancia influence) cams per head and an Italian rating of 350 bhp at 7200 rpm. The usable revs are more like 8000 or about 1000 rpm more than the single-cam V-12's, which are derived from old Colombo designs and Lampredi improvements. After a good '56 season, alternating with the 3.5 liter Monzas in speed, a single-cam car won the Buenos Aires Thousand Kilometer race against meager opposition from its twin-cammed team mates. In spite of this, the newer car was the Sebring favorite, and was given first choice of drivers. The enlargement to 3.8 did seem to give it a speed margin over the older 3.5's.

Hill's #14 single-cam 3.5 was turning 6800 on the long straight, somewhat over peak, and co-driver Von Trips remarked that it had plenty of punch coming out of the corners but seemed to fluff out at the top end and on downshifts. All four Ferraris had the same final drive ratio, which

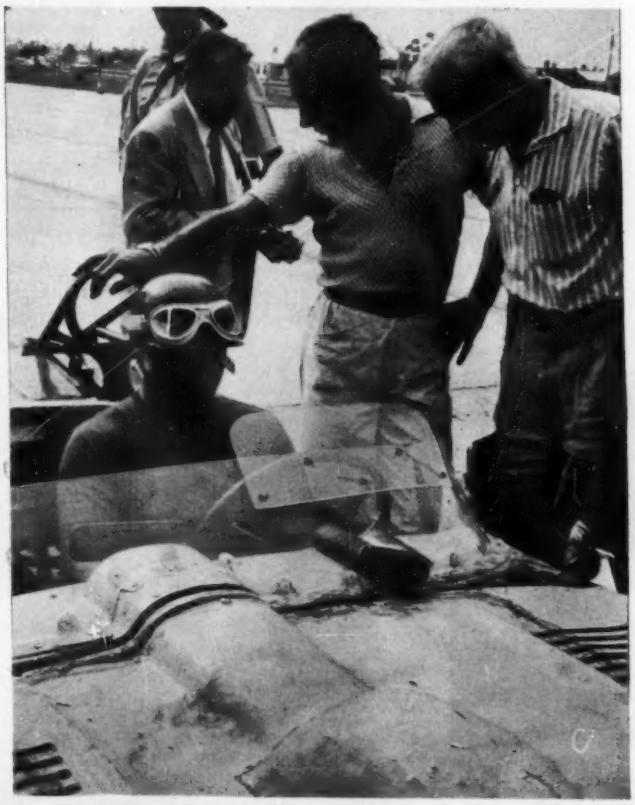
Fitch and Duntov watch patiently as heads on experimental SS Corvette are changed from aluminum to cast iron. Car had Fiberglas body screwed to wood bulkheads, was test bed only.





Momo demonstrates new quick-change Dunlop front brakes for D-Jags. As pads wear, "T" on back plate mates with notch which can then pull pad out.

Chevrolet's greatest moment: Fangio takes wheel of above SS (stands for Super Stovebolt) and recalls own homebuilt Chev single-seater. Moss, Duntov look on apprehensively.



emphasized acceleration and favored the 3.8's at the top end. A higher cog was tried in Collins' 3.8 during practice, but the car couldn't pull it and it was switched back. Much pre-race time was spent trying to get just the right plugs for the 3.8's, the 3.5's being less finicky.

Incidentally, the layout of the 3.8 Ferrari shows well the intake port problems that crop up with a 60 degree vee engine. Everything is crammed into the center between the heads, and it's impossible to get a die-straight path from the carb to the intake valve to get the most from ram tuning. This is why the carbs have been inclined toward each other in the latest versions of both the Lancia and the Maserati V-8 engines. The brilliant new Maser GP V-12 has vertical ports, like the M196 Mercedes, and they'll have no worries in that department.

Zora Arkus-Duntov's design staff had more than enough problems with the completely new chassis of the SS Corvette, so the power plant was good and hot but not really radical in any way. There wasn't enough time to develop either the improved injection system or the light alloy block, so the basic engine was very much standard Corvette. A great deal of useful development work was done on a working prototype of the SS, which was rushed together with a rough body and hustled down to the course for on-the-scene testing. The idea was that changes made on this car could be incorporated in the finished SS before the latter ever saw daylight, but this is a very theoretical procedure and resulted in a very fast and raceable prototype plus a beautifully-detailed SS about which little was known other than that the cockpit was like an oven.

As part of the sales pitch for the driving job, Piero Taruffi was assured that the finished SS weighed 150 pounds less and had twenty horses more than the "bucket of bolts" which had gone so fast under Fangio and Moss in practice. The source of these ponies was not named. One difference

(Continued on page 46)

HOTTER HANDLING

Detroit machinery can be made to handle well enough to take on a road course -- and corner at sports car speeds.

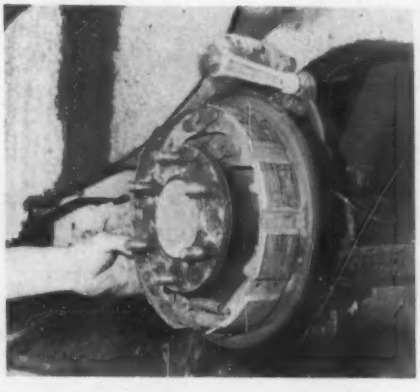
By ROGER HUNTINGTON

SPORTS car enthusiasts have been hooting at the "roadability" of Detroit family cars for the last twenty years. Up until three or four years ago they deserved every hoot. They wallowed through turns, screamed the tires under even small side loads, rolled at unbelievable angles, understeered to the danger point, snaked at speed on a straight road, and generally misbehaved like a road grader on four pillows.

We don't have so much to hoot at today. Detroit has gotten busy and improved roadability drastically in the last few years, spurred by sky-rocketing performance figures and public pressure for safer cars. Developments like torsion bar suspension, outrigger rear leaf springs, sea-legs shock mounting, special rear leaf spring deflection geometry, low CG's, ball-joint front ends, anti-brake-dive front geometry, trailing-arm effect on front wheels, finned brake drums, etc. have completely changed the handling of our family cars.

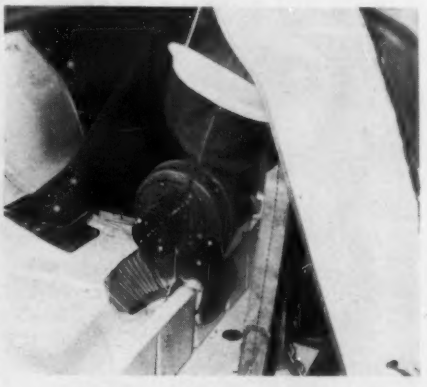
Unfortunately, these important developments have gone right over the heads of many sports car purists. Those who weren't in attendance at certain competition events on the Elkhart Lake, Willow Springs, and Paramount Ranch road circuits in the last 18 months are still singing the same old tunes about Detroit chassis development. But, sports car fans who saw the NASCAR and USAC stock car racing boys tackle these car-killing courses with basic Detroit passenger sedans got a thorough shaking-up. For one thing, they saw slightly-modified family cars lapping at average speeds *within 6 or 7%* of the fastest Ferraris and D Jags. They clocked this iron through turns in times comparable with most sports cars in the 90-110" wheelbase range. Acceleration coming off the turns would embarrass many a 140 Jag. And they saw these big 3500-lb. cars do this lap after lap—up to 250 miles—without chewing through brakes and tires like butter.

There's an important lesson in all this for anyone who drives a Detroit product: With some relatively-minor modifications and addition of special equipment, a full-size American passenger sedan can be given very decent handling and cornering, even by average sports car standards. Detroit has given us something to work with in the last few years. With this as a base—and using lessons learned by the stock car racing boys on road circuits and oval tracks—we can conceivably combine the economy and convenience of a family car with acceptable all-around road performance.



Bendix Cerametallix segmented brake linings can operate efficiently at more than 1500°.

Finned drum, Frendo lining, elaborate air scoop system keep these brakes from fading.



Blower setup for cooling rear brakes on Mercurys at Elkhart is same as on Mexican Lincolns.

Stock suspension on new U.S. cars has been improved by such items as torsion bars, outrigger rear leaf springs and sea-leg shock absorbers. More improvements will help stability of car.

I'm not saying you can make a Ferrari out of it, or that the car you buy in the showroom is ready for road gymnastics as is; but the fact remains that giant strides have been made in developing the inherent road potentialities of the U. S. passenger car chassis.

Here are some of the things we've learned that might help you improve your own car.....

THE SUSPENSION PROBLEM

Most sports car enthusiasts have the idea that good handling and cornering demand super-stiff springs and shocks. It's not quite that simple. Prior to the mid-'30's, when cars used solid beam axles front and rear, the faster cars were going to even stiffer springs. All that the engineers were doing, in effect, was to throttle the shimmy and tramp that always plague a beam front end. The Germans found that relatively softer suspensions gave better results when they went to 4-wheel independent suspension on their 180-mph Grand Prix jobs of the late '30s. The secret was that, with i.f.s., optimum suspension stiffness will depend primarily on the CG height and the sprung/unsprung weight ratio. The German G.P. cars had very low CG's and unsprung weight figures.

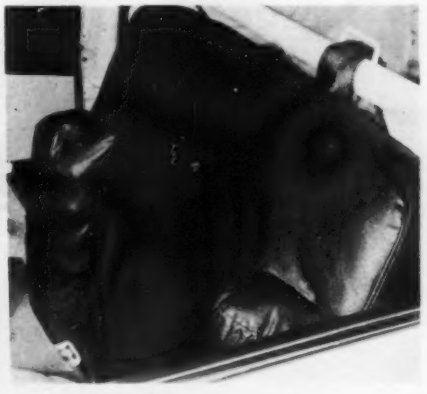
On an American passenger car we have neither a very low CG nor low unsprung weight; furthermore, suspension stiffness is dictated far more by ride than roadability requirements—even in this "new era". So, where some racing men are learning to soften suspensions, we must stiffen. The NASCAR and USAC racing rules are quite lenient on this. They allow commercial overload springs boosters (like Air-Lifts and Hellwig stabilizers), and double shock absorbers. The CG can be lowered with blocks. The springs themselves, shocks, and torsion anti-roll bars must be factory parts, however.

(Before we go a step farther, let's clarify this business of "factory parts". Since Detroit has gotten into stock car racing with both feet the various companies have been obliged to come up with a lot of special parts designed for racing *only*, not at all suitable for production stuff. These would include the special springs, roll bars, and shocks mentioned above, heavy-duty hubs, extra-large gas tanks, engine hop-up

(Continued on page 56)

Here's a quick change of shocks in Chevrolet pit just before a race at Elkhart Lake.

Goodyear blue Streak road racing tires on 8" rims on Chrysler 300B. Inflation is 50 psi.



Special backs on Mercury seat were said to give better support than bucket type seats.

DO IT YOURSELF...

ONE MAN'S POISON

By BROWN MEGGS

The case history I'm about to unfold begins with a '53 Porsche Coupe: Model 356, the factory calls it. Fine little car — for *some* people. Only not for this close friend and business associate of mine, Bill by name. Bill's got nothing personal against the Model 356. As a matter of fact, he takes great delight in the technical niceties of Dr. Porsche's sweet little bomb. But Bill's had a little — let's call it *bad luck*. I'll show you what I mean.

Being a sensitive fellow who fancies the finer things in life, Bill's a long-time sports car enthusiast. Admired the MG-TC the day it first came off the boat. Owned part interest in a Jag SS-100 while still a college lad. You get the idea.

Only one trouble with Bill: he's got a wife and two kids. Not unusual you say? Maybe not. But somehow — what with income tax, lunch money, and such luxuries as food and clothing for the kids — there's just not enough left of Bill's $9000 annual gross (painfully earned in the Detroit ad agency where Bill and I share a copy desk) to pay for one o' them funny little foreign cars, *plus* the massive six-place domestic saloon Bill needs to transport wife and kiddies to the in-laws on week-ends.

That's where I came in. *I* was the wiseguy who showed Bill a way to beat the rap — a way to fit a real slick foreign buggy into his life *without* the monstrous cold-cash expenditure required for, say, a spanking new Alfa-Romeo Spyder. My secret? Simple. Smart shopping for a clean second-hand sports buggy, plus a liberal dose of weekend do-it-yourself. My system was foolproof — on paper.

We kept our eyes and ears open, and sure enough a hot

Only 13,000 miles . . . in one week!

Now lemme see...

Growing inferiority complex.

tip came our way. One of our agency's clients revealed that a certain GM division was about to auction off a '53 Porsche Coupe they'd been testing. We rushed out to see it, and she (*it* quickly became *she,* as in Portia) turned out to be a glistening green beauty only 13,000 odometer miles from Herr Hoffman's Park Avenue showroom.

"Wudda yuh think?" asked Bill.

"Snap her up, boy!" I urged.

It was that easy. Bill's bid was a ridiculously low $1200, and apparently nobody else even bothered to submit one. Two 'phone calls and twelve bills later Bill had himself just what he wanted: a true sporting machine that could double when necessary as a practical go-to-market car.

"At that price, how wrong can I go?" mused Bill.

It took us six months to find out. We picked her up, Portia that is, late one Friday afternoon and drove her home to Bill's place. The trouble, not to say disillusionment, began Saturday morning.

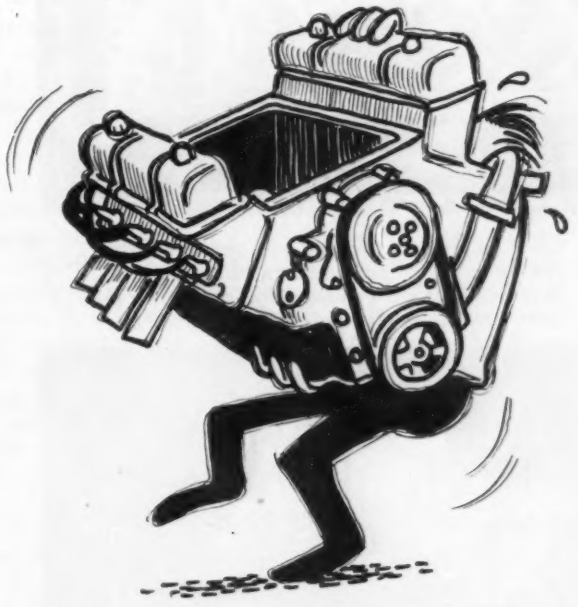
What we hadn't known was that the GM test boys had put their 13,000 miles on Bill's green gladiator in *one week* — 'round and 'round the old test track at something over one hundred miles in the hour. To make things more interesting, they'd installed a special rack for sliding weights in the rear compartment — over the kids' seats — and used this ingenious mechanism to alter the usual Porsche oversteer. They were careful not to mess up the pretty corduroy upholstery — but wow, what those weights did for wheels and transmission!

To make a long and tortuous story short and brutal, engine, transmission, rear-suspension and wheels "needed work." We weren't fazed. We'd counted on bringing our combined do-it-yourself talents to bear — and before you could say Stuttgart, we'd rented a VW service manual — Porsches are like VW's, aren't they? — and scattered parts all over the floor of Bill's garage. That's where we do-it-yourselfers held the upper hand: labor cost us nothing.

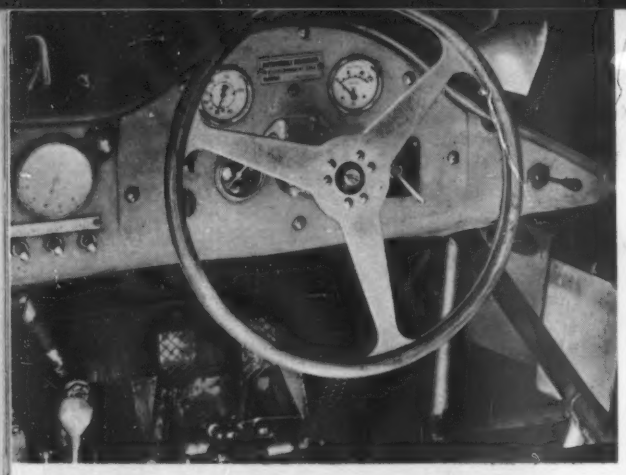
Unfortunately, labor isn't quite enough. Occasionally you need parts. Even a "simple" design like the Porsche involves dozens of components, and before we knew it, Bill was out another six bills. Parts which looked and acted just like VW parts selling for, say, $13, suddenly took on new prestige and found themselves merchandised at a handsome $39.

(Continued on page 59)

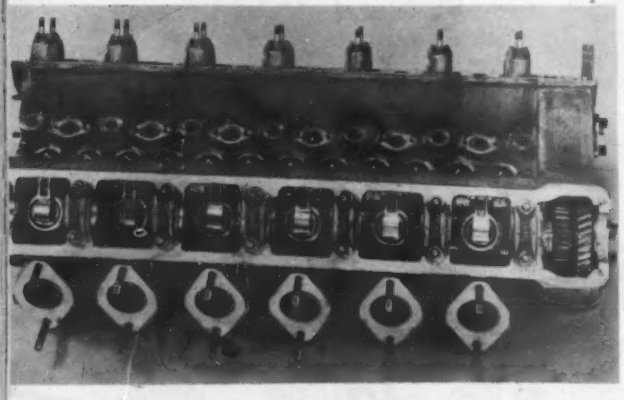
It's love, it's an Alvis . . . here we go again.



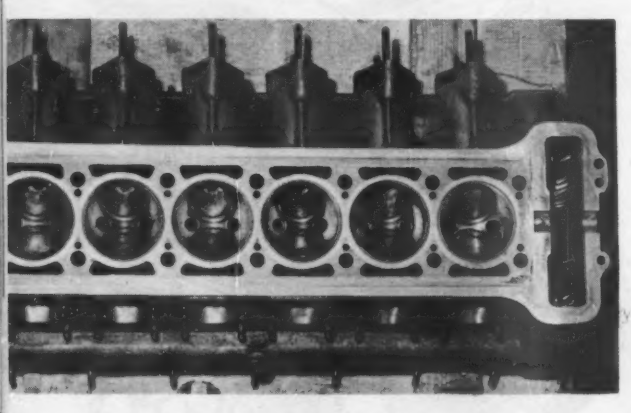
When in doubt—swap it.



Cockpit of early 300S shows clutch housing cover and engine mount arch, plus pedal and frame lay-out. New Stewart-Warner gauge shows radiator outlet temp., inlet temp., above. Oil pressure right.



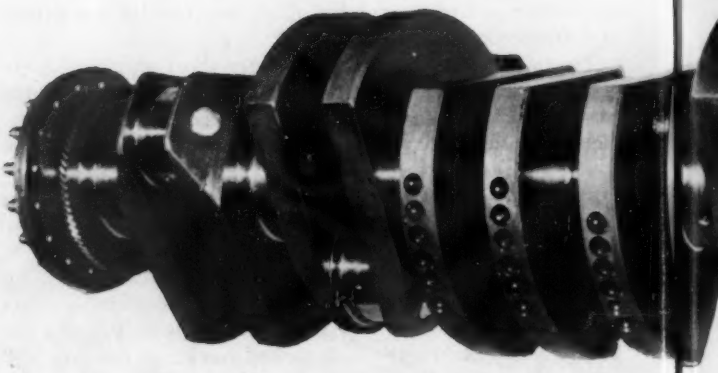
Cams removed, finger followers and coil spring retainers are revealed. Six studded holes down head center are for water intake manifold. Some GP heads have 10 mm plugs, paired plug holes blended.



Combustion chambers are subtle variation on hemispherical shape. All ports, including oval exhausts, have been cleaned up. Also visible are seat inserts, twin plug holes and cam drive cogs.

SCI Technical Report:

MASERATI



Torn-down block, sump reveal many design features. Massive mains have radial web bracing, meaty studs which follow through for head. Integral split clutch housing has vents plus six-stud rear engine hanger.

Fangio might have driven 300S instead of "Bazooka" at Sebring, is checking out new factory car. Tail squats low as he digs out of corner.

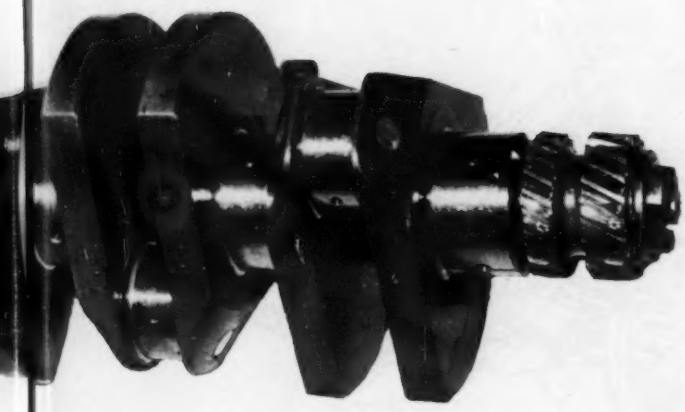
300S

By KARL LUDVIGSEN, SCI Tech Editor

THE men of Maserati are back on the move again. 1957 promises to be their greatest season since 1948, when the twin-blown 4CLT's won seven major Grand Prix races. That year the Maserati brothers packed up their ideas and hied to Bologna to build OSCAs, literally leaving the Orsis in the lurch. For three years Masers were absolutely nowhere in both GP and sports car racing and young Omer Orsi finally got fed up with this and set up a new racing department for '53. Bellentani was hired, and did much good work until switching to Ferrari in 1956, while the great Colombo did consulting redesign on the Formula II car that was then current. This talent has gradually brought the emblem of the Trident to the fore again. There's no better single symbol of this resurgence than the 300S sports car.

This machine, which promises to be a modern design classic, gave Maserati its first victory in a Sports Car championship event at Buenos Aires in 1956. It was then and still remains the mainstay of the factory team. In keeping with established Maserati policy the 300S has also been sold to private owners from the very beginning of the type, the first three cars coming to this country for the 1955 SCCA season.

In the three liter class this rapid six-holer is picking up where the Monza Ferraris (SCI, June, 1956) left off. Perhaps even more than the Monza the 300S is well suited to maintenance and racing by private owners for whom it nearly assures a class win (in the absence of 300SLR's) and gives a clear shot at an overall victory. Again like the Monza it's based directly on a Grand Prix car from which it evolves very logically, as follows.



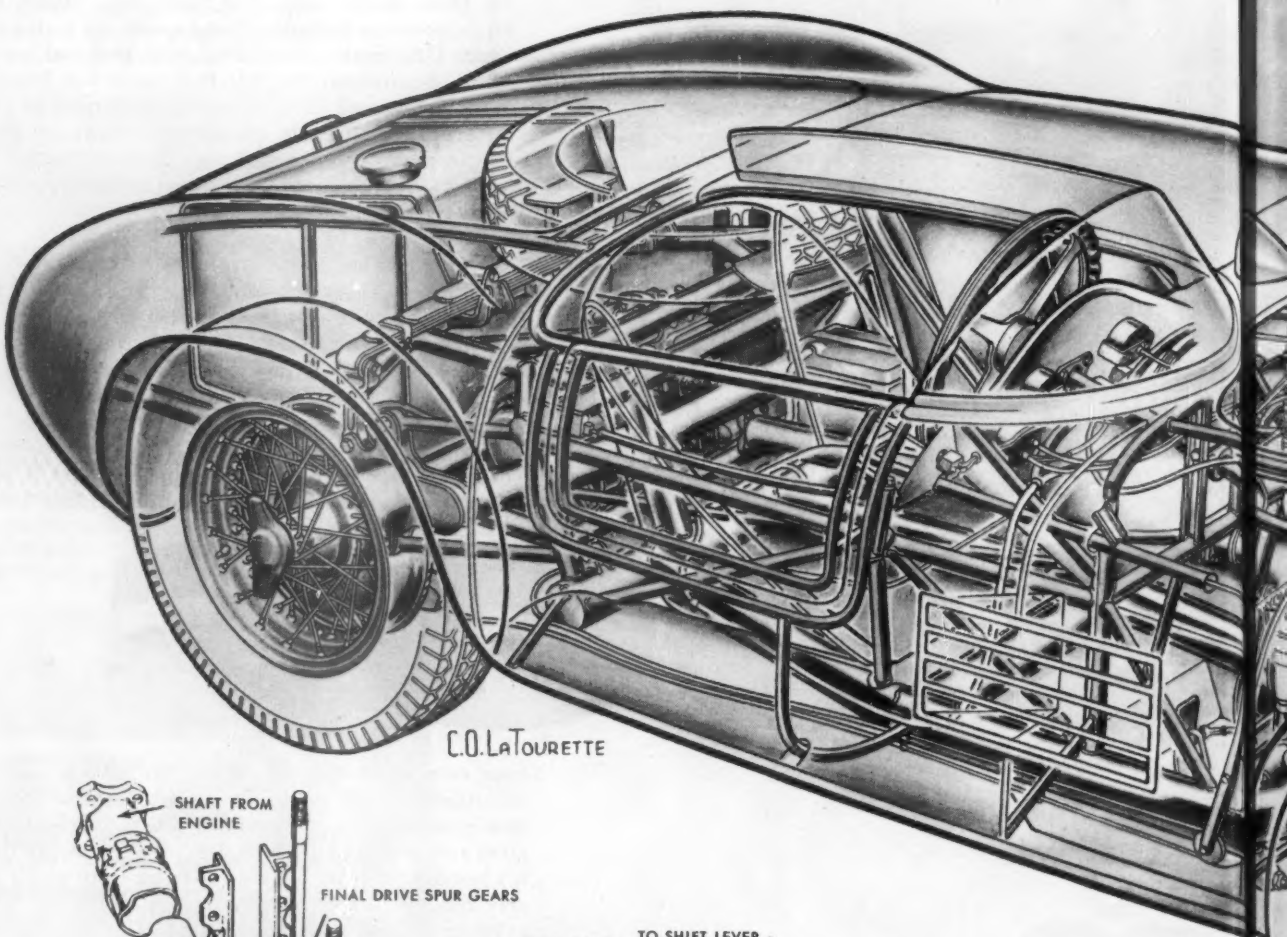
Forged and machined crank is a nice piece of work. Small plugs were set near rod journals after passage drilling. Flywheel drive is multi-lug; helicals turn pumps, mags, cams.

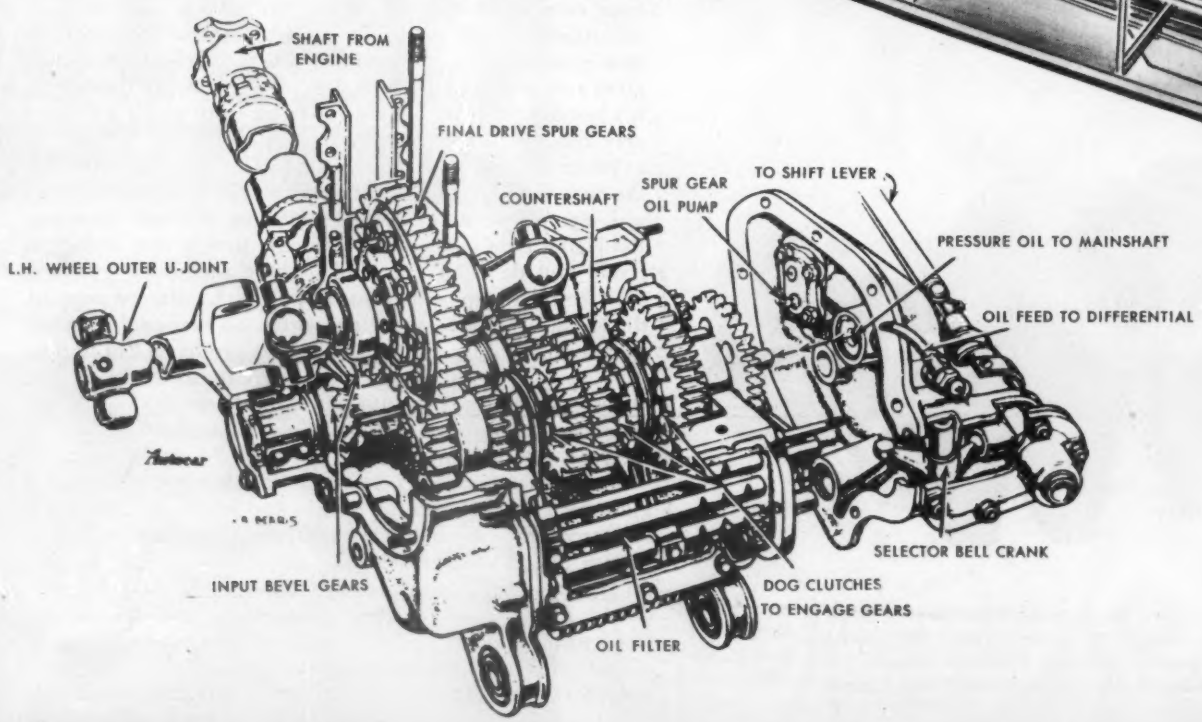
When the 1954 GP Maserati (Type 250F) appeared for the first time in the Argentine Grand Prix of that year, it was seen to be a complete revision of previous concepts. Replacing twin tubes and a live axle were a new truss-type frame and de Dion rear end with rear-mounted gearbox. This being an immediate success, a much enlarged copy of the chassis was made and fitted with a 2.5 liter engine tuned to run on gasoline. Called the 250S it produced 240 bhp at 7200 rpm on the bench, and after careful study of the D-Type Jaguar and the 1954 Le Mans Bristols the car was fitted with a very streamlined body with slight finning at the rear.

This special made its debut at the 1954 Supercortemaggiore race in the hands of Fangio and Marimon, who kept it in second place behind Hawthorn's winning three-liter Monza until shortly before the end. It was retired by the oil feed and foaming problems that were also plaguing the Grand Prix version at that time. Musso and Mantovani were wheeling a second 2.5 Maserati there, which had a similar engine mounted in a much-modified ex-two-liter A6GCS chassis. The only visible change was the addition of

MASERATI 300S...

stroked Grand Prix machine with fenders





300S MASERATI
SPECIFICATIONS

POWER UNIT:

Bore & Stroke (Engl. & Met.)	3.31 x 3.55 ins (84 x 90 mm)
Stroke/Bore Ratio	1.07/1
Displacement (Engl. & Met.)	182 cu. ins. (2991 cc)
Compression Ratio	8.6/1 or 9.5/1
Carburetion by	3 Weber 45 DCO 3
Max. bhp @ rpm	260 @ 6500
Max. Torque, lb. ft., @ rpm	231 @ 5000
Oil capacity, total	6.6 gals.
Spark plugs	Lodge RL 49 or RL 51, gap 0.025 in.

Camshaft–	Intake	Exhaust
Opens	42° BTC	63° BBC
Closes	66° ABC	27° ATC
Lift	.493 in.	.453 in.
Valve head dia.	1.81 in.	1.58 in.
Port dia.	1.66 in.	1.77 x 1.5 in.

DRIVE TRAIN:

Transmission ratios

Rev.	2.6/1
I	2.14/1
II	1.45/1
III	1.2/1
IV	1/1
Bevel combinations:	11/15, 12/17, 11/16, 12/18, 11/17
Spur gear combinations:	48/12, 47/13, 46/14, 45/15, 44/16

CHASSIS:

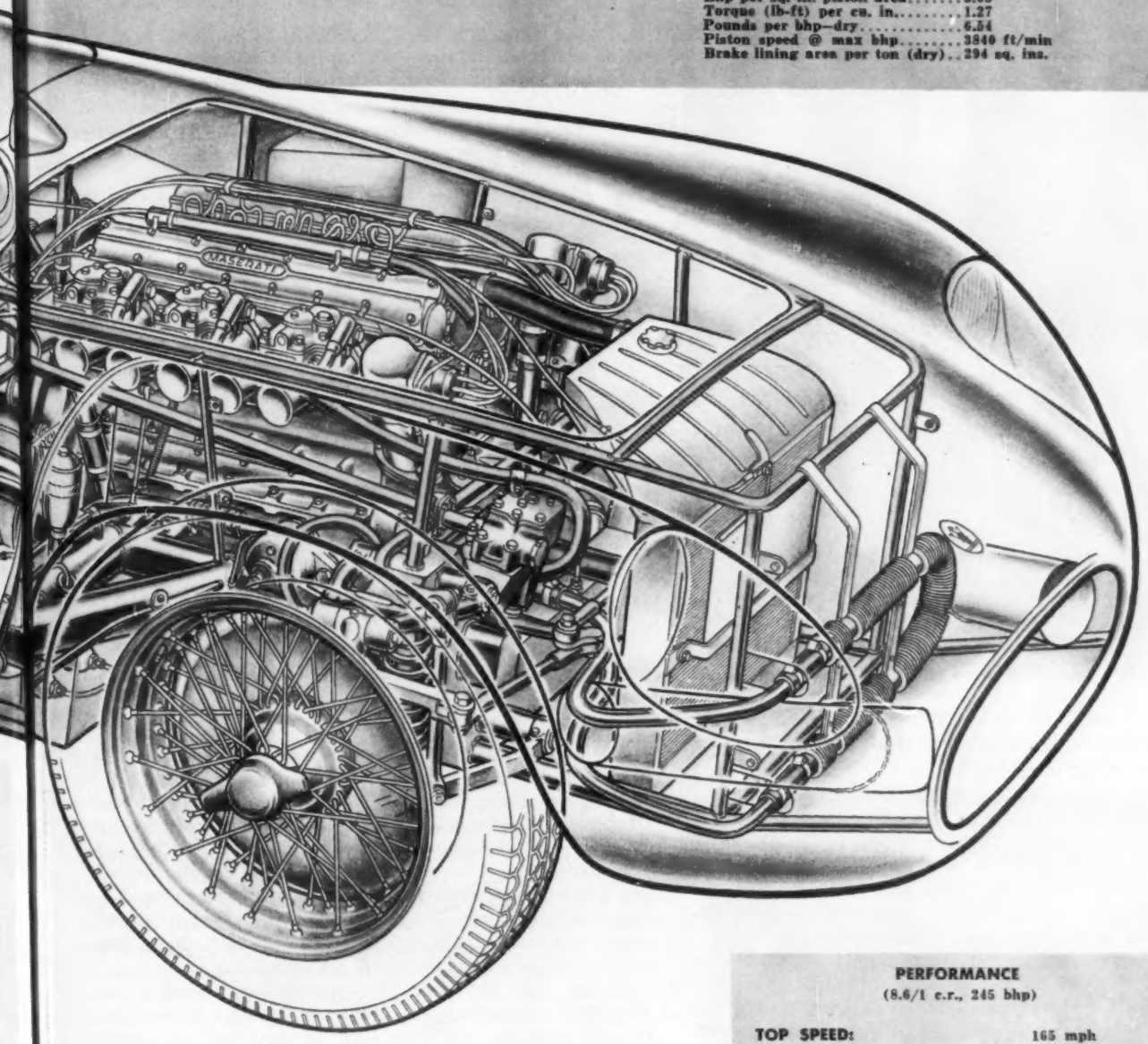
Wheelbase	91.3 ins.
Front Tread	51.3 ins.
Rear Tread	49.3 ins.
Suspension, front	Coil and forged wishbone, anti-roll bar
Suspension, rear	de Dion, parallel trailing arms, transverse leaf
Shock absorbers	Houdaille rotary type
Steering type	Worm and sector
Steering wheel turns L to L	3½
Turning diameter	32 feet
Brake type	Modified two-leading-shoe, twin master cylinders
Brake lining area	250 sq. ins.
Wheels	Borrani wire, splined hubs
Tire size	600 x 16 front, 650 x 16 rear
Tire pressures	28 to 34 psi, approx. 2 lbs. higher in rear

GENERAL:

Length	165 ins.
Width	63 ins.
Height (to cowl)	37.5 ins.
Weight, dry	1700 lbs.
Fuel capacity–U. S. gallons	38 or 45 optional

RATING FACTORS:

Bhp per cu. in.	1.43
Bhp per sq. in. piston area	5.05
Torque (lb-ft) per cu. in.	1.27
Pounds per bhp–dry	6.54
Piston speed @ max bhp	3840 ft/min
Brake lining area per ton (dry)	294 sq. ins.



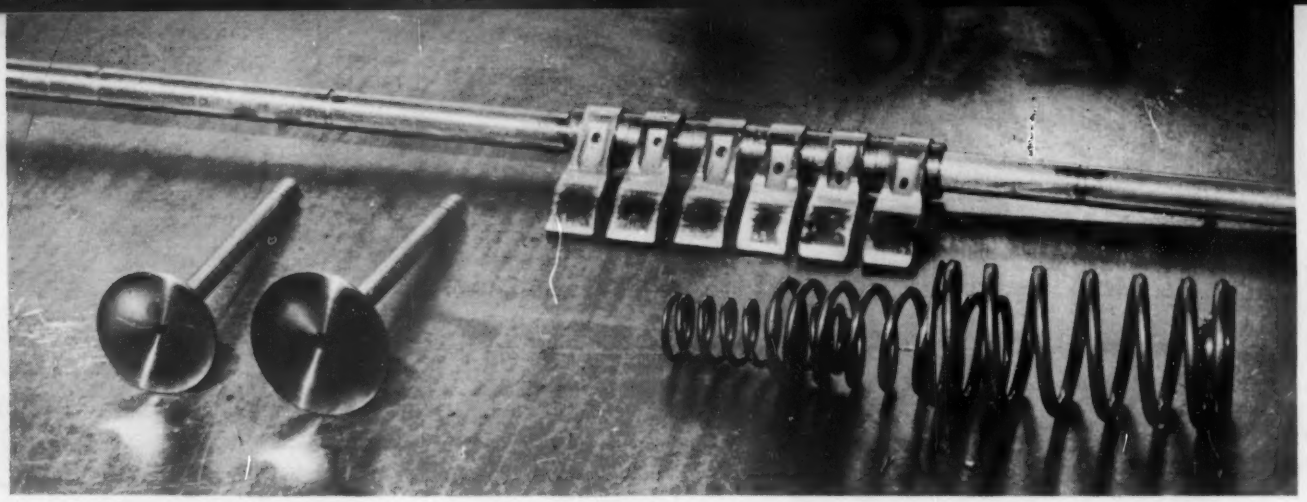
PERFORMANCE
(8.6/1 c.r., 245 bhp)

TOP SPEED: 165 mph

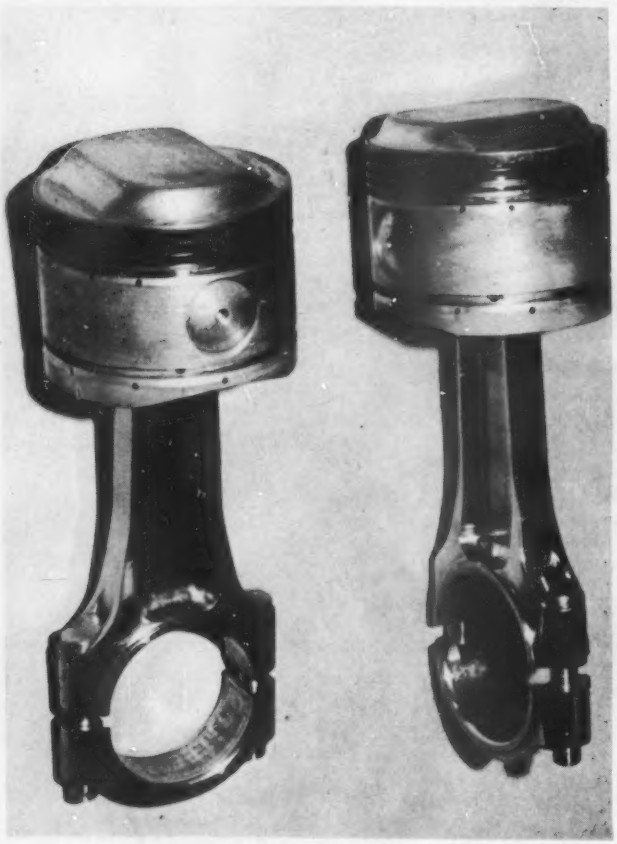
ACCELERATION:

From zero to	Seconds
40 mph	4.0
60 mph	5.5
90 mph	9.0
100 mph	11.5
110 mph	14.0
120 mph	19.0

(Performance and development data supplied by Hans Tanner.)

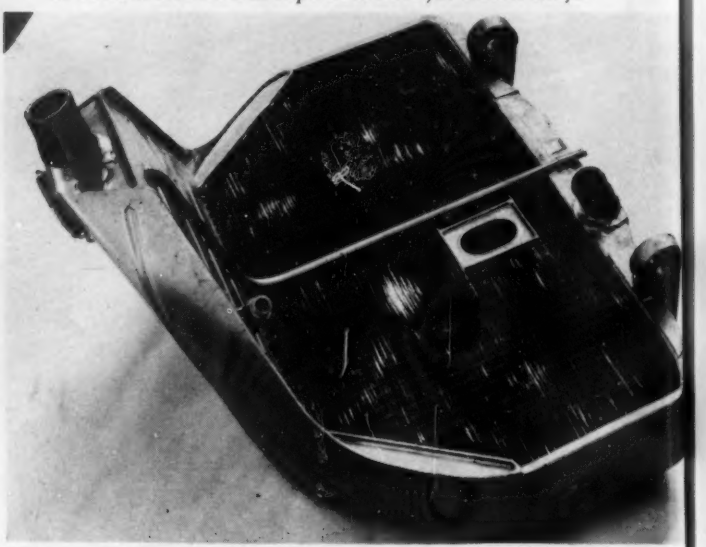


Slid together here on shaft are six finger-type cam followers, showing holes which spray oil on cam lobes. Exhaust valve is heavy-sectioned near seat and fully finished. Triple coils look big enough, no?



Use of seven mains in moderate-bore six-holer limits big-end bearing width, but rod strength is tops. These pistons give 8.6/1 ratio. Hotter ones have much more peaked crown contour.

Neat blending of radiator core and header tank promotes lightness, strength. Support is by two Silentbloc bushes at bottom and hose at top! Oval hole for starter shaft.



a headrest, and the machine might have caused some alarm among the two liter class boys!

Work went on after these experiments, the next step being a 2.8 liter version contrived by increasing the bore from 84 to 89 mm, while holding the stroke at 75 mm. This however was unsuccessful in dyno tests and work on the 280B, as it was called, was abandoned. A new 2.8 was then built with a bore and stroke of 81 x 90 mm. Known as the 280S, this was to be the basis for the production 300S later on.

The 280S was built to run on alcohol fuel as was the 250F Grand Prix engine, and in this form it gave 280 horses at 7500 rpm. In a hydroplane driven by Guidotti this engine scored a number of wins, and one of the alcohol versions was installed in the Supercortemaggiore car for testing at Monza. Villoresi caused a big uproar by lapping the old course with it in 1:59, a time not even reached by Grand Prix cars since the days of the 159 Alfa Romeo. At that time it was popularly believed that the Maserati was of three liters capacity and running on gasoline, while in actual fact the three liter engine hadn't so much as been bench tested then. This "stunt" shook up the opposition more than a little and improved factory morale at the same time.

First full three liter built was the 300S Ex. With the oversquare dimensions of 92 x 75 mm this delivered 225 bhp at 6000. This was considered inadequate, so the 280S was resleeved up to 84mm—the resulting 300S engine putting out 245 horses at 6200 rpm. Steady development since then and experimentation with compression ratios have produced alternate ratings of 250 at 6700 and 260 at 6500, depending on the type of racing for which it's set up.

At that time (very late '54) a second body similar to the Supercortemaggiore car was built, but before it received its coat of paint the new body style for the production three liters had been set and it was hustled back to the shop to have the fins rounded off the rear and a shorter, wider front end fitted. The original special test car received a 300S engine, a coat of metallic blue paint and was sold to a customer.

Official announcement of the new model was made at New Year's, 1955, and entry for Sebring was made specify-

ing two liter cars to avoid embarrassment if the new cars weren't ready. They did appear and took third and fourth places, setting fastest lap in the process. Spear, Lloyd and Cunningham acquired these plus one more and enjoyed reasonable success in U.S. racing. Behra drove the 300S to its first major win at Bari on May 15th, after a duel with a 3.75 Ferrari, and he and Musso were to do well through the rest of the attenuated 1955 season in these cars.

Moss was a big help to Maserati in 1956, when the 300S won races at Buenos Aires, the Nurburgring, Frontiers, Paris, Silverstone, Bari, Caracas and in Australia. '57 is off to an equally flying start, with Fangio's Cuban win and a performance at Sebring which indicated that the 300S could have won outright if the new 4.5 had conked out. The three-liter's practically bug-free now thanks to three years of development in its own right, plus the additional information gleaned from the Grand Prix car, which still uses a nearly identical engine and drive line (see SCI, April, 1957).

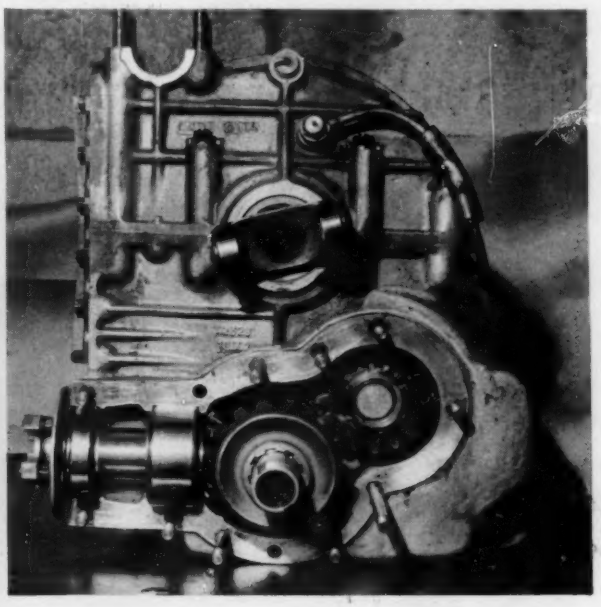
Major structural difference between the 250F and 300S is the much longer stroke of the latter, the bore sizes being identical. In fact this Maser joins the Jaguar XK series engine as a long-stroked outcast in the days of the big, big bore. No attempt is made to rev these mills much over 6700 which is just a shade below a piston speed of 4000 feet per minute—generally regarded as the working limit for modern racing engines. In return for moderation in this department the designers got a compact combustion chamber, in which fuel burning can easily be controlled and a high compression ratio maintained without detonation problems. Such smooth burning is also good for torque, of which the 300S six has plenty.

The block of the 300S extends from the centerline of the crankshaft up to the top of the cylinders which are capped by a conventional detachable head. The upper section of the block is nothing more than an aluminum alloy tank surrounding six nitrided iron wet cylinders. These are so closely spaced that the sealing flanges at the tops of adjacent cylinders have mating flats to prevent both interference and lining rotation. For its displacement this engine is remarkably short, thanks largely to the chummy snuggling together of these removable cylinders. A wholly cast block with these cylinder centers would have uneven cooling around the bores.

At the bottom of the block—the upper half of the crankcase--is heavy ribbed webbing to support the seven main bearings. Fourteen long husky studs run upward from this webbing to clamp the head down, and downward to retain the main bearing caps which have two additional studs (total four each) to limit distortion as much as possible. All bottom end bearing shells are Vandervell lead-indium type

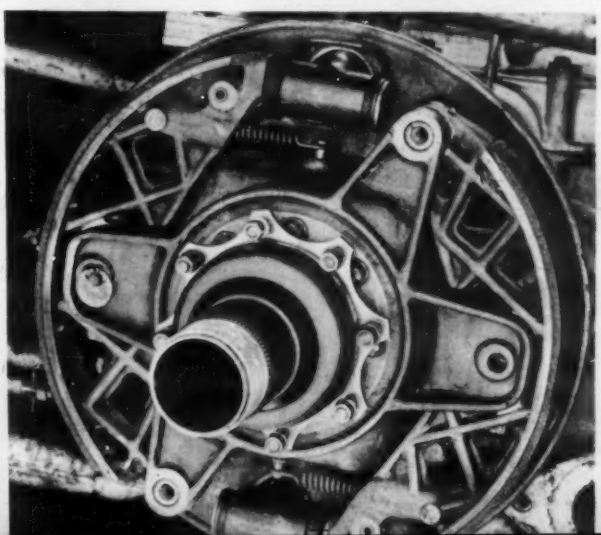
(Continued on page 61)

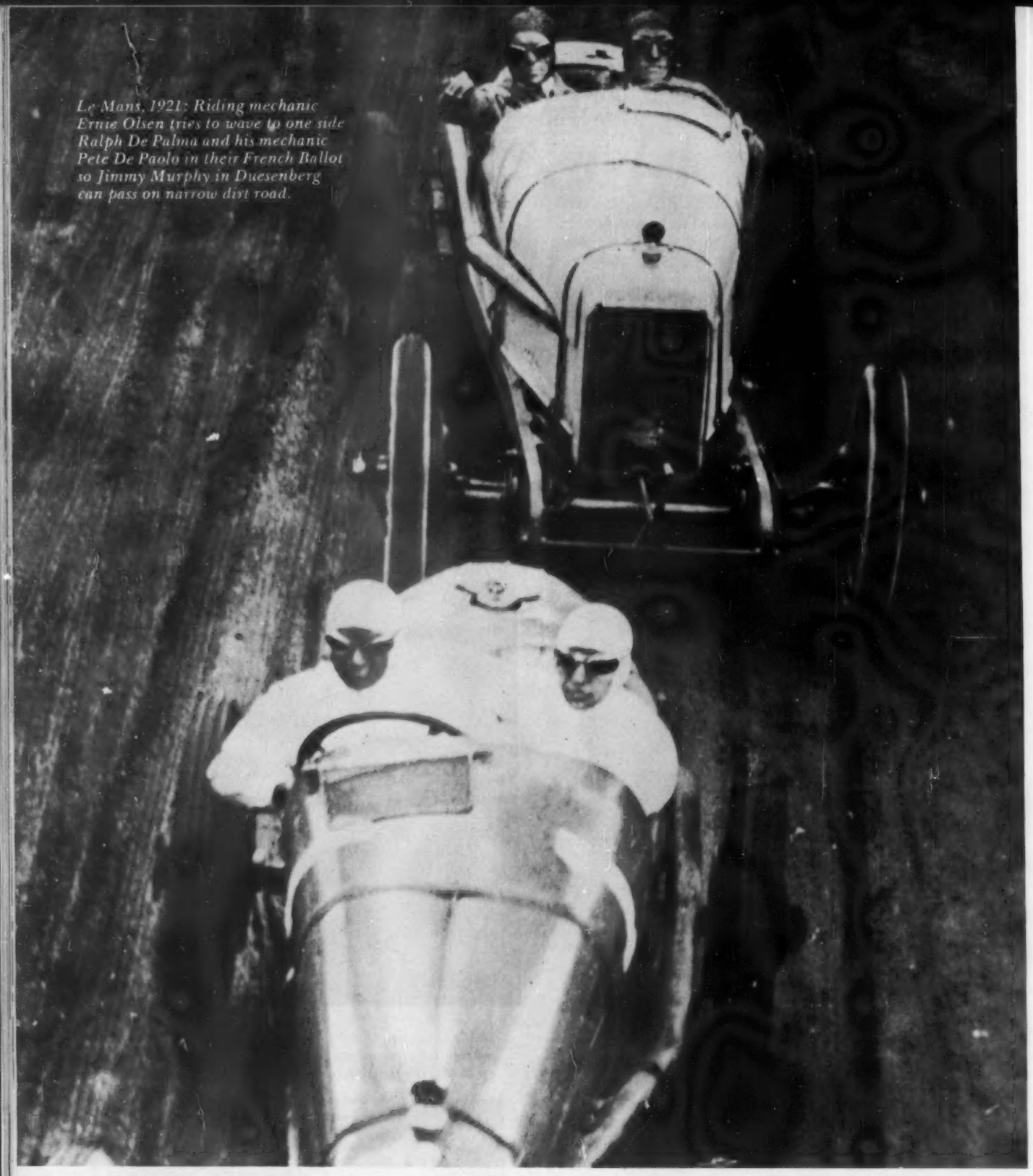
Left side of gearbox with cover off shows easy-changed bevel input to countershaft, and mainshaft spur that turns differential above. De Dion tube guide at left.



Torn-down clutch exposes cover plate and withdrawal levers, plus flat splined pressure plate. Three aluminum driven discs are splined to output hub at right.

Brake shoes (these are left rear) have 2LS layouts, are trussed for strength and lightness. Italians no longer go wild with tools, machining only where necessary.

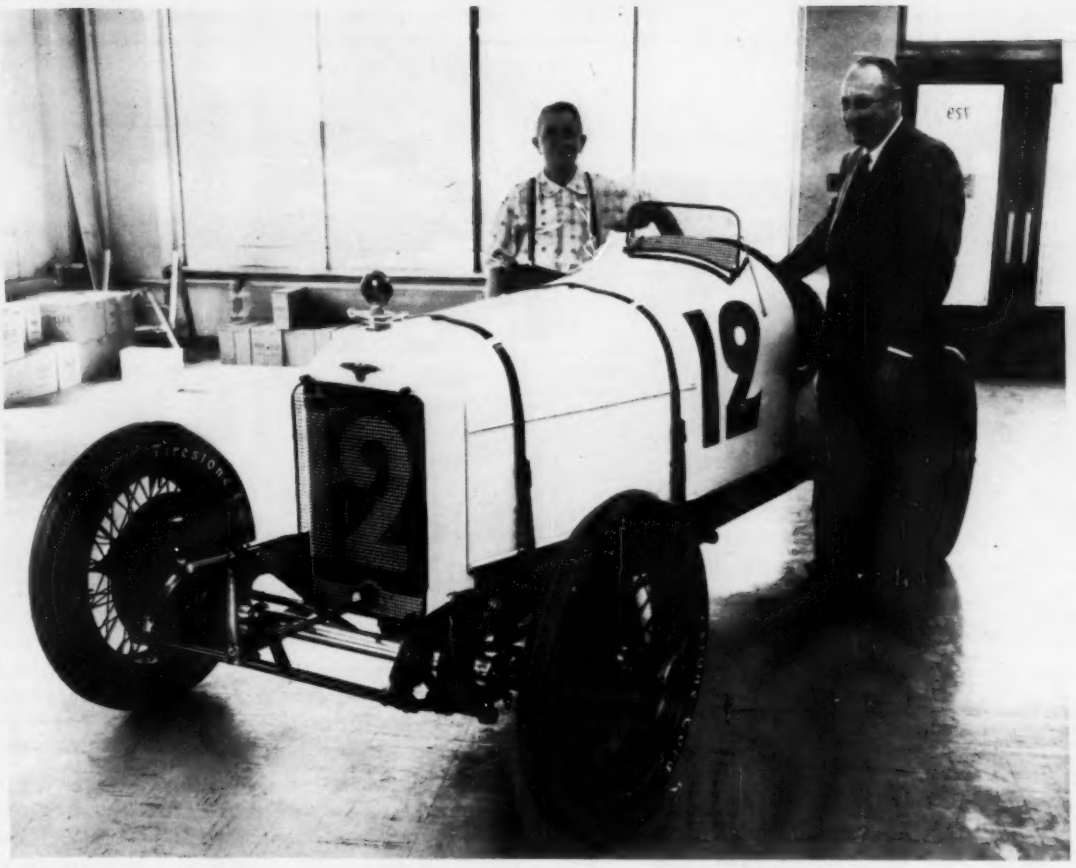




Le Mans, 1921: Riding mechanic Ernie Olsen tries to wave to one side Ralph De Palma and his mechanic Pete De Paolo in their French Ballot so Jimmy Murphy in Duesenberg can pass on narrow dirt road.

By GEORGE MOORE

THE MIGHTIEST DUESY



Herman Ringling, left, builder of the original Duesenberg body in 1921, and Karl Kizer, leading figure in the restoration program, show the rebuilt racing veteran. Board track front tires will be replaced with road tires upon delivery by Firestone. Work on car was done at Kizer's Indianapolis machine shop.

IT was a hot, dusty Monday afternoon in provincial France when a dirt-caked American driver in a somewhat battered American race car did something considered impossible. He won the French Grand Prix run at Le Mans.

Jimmy Murphy, driving a Duesenberg with a hole through the radiator and two tires going soft, overcame the handicap of taped ribs and poor sportsmanship to polish off a victorious ride at a record breaking 78.107 mph. Thirty-six years later, as the Le Mans of 1957 gets underway, a gleaming, restored Murphy Le Mans Duesenberg will be rolled into a place of honor in the Indianapolis Motor Speedway Museum at the site of the annual 500-Mile Race.

In between that July 25, 1921, and the present time, this tremendous piece of machinery took part in a lot of automobile racing. Built by Fred and August Duesenberg in their plant at Elizabeth, N. J., the four-wheeled jewel set a blistering pace at tracks like Beverly Hills, Uniontown, and San Carlos. But as is usual, after its days as a top contender were over, the valiant steel charger was relegated to the osbcurity of the country's dirt bull rings. The formula change to smaller engines and single seaters at the end of the 1922 season had made the two-man 183-cubic inch Duesy obsolete.

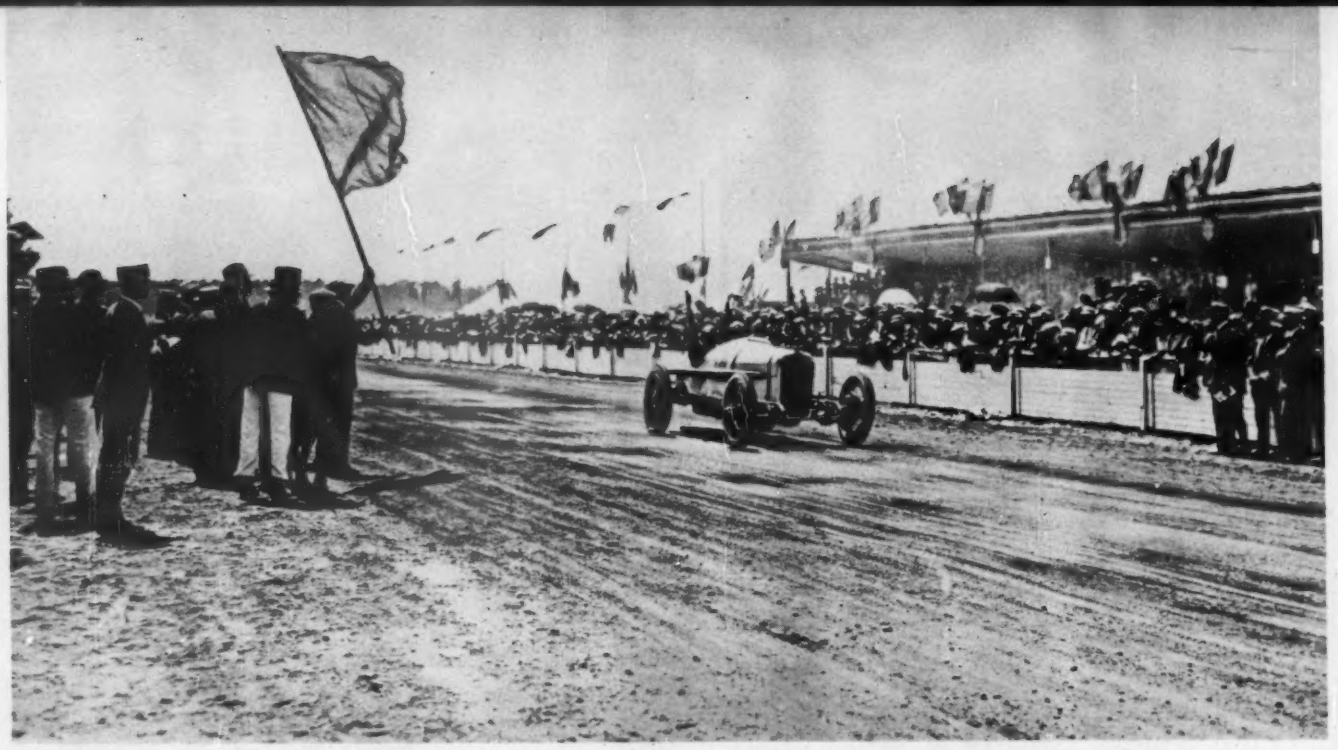
When Ernie Olsen, Murphy's riding mechanic in the European event, discovered the machine in the rear of a storage garage at Long Beach, Calif., the sight that greeted him was not one of inspiration. Due to its constant downward path, the old battler had just about taken the last count. The tires were flat, the body gutted, dirt and rust covered everything, and innumerable small items either were missing or piled into boxes in a haphazard manner.

The heavy-footed chauffeur who once held on to the car's bucking steering wheel had a tremendous amount of courage, but his fortitude was no greater than the spirit of the men who picked up the decaying hulk of this former champion to restore the automobile to all its former glory. They were instrumental in undertaking a mammoth task called "Operation Duesenberg."

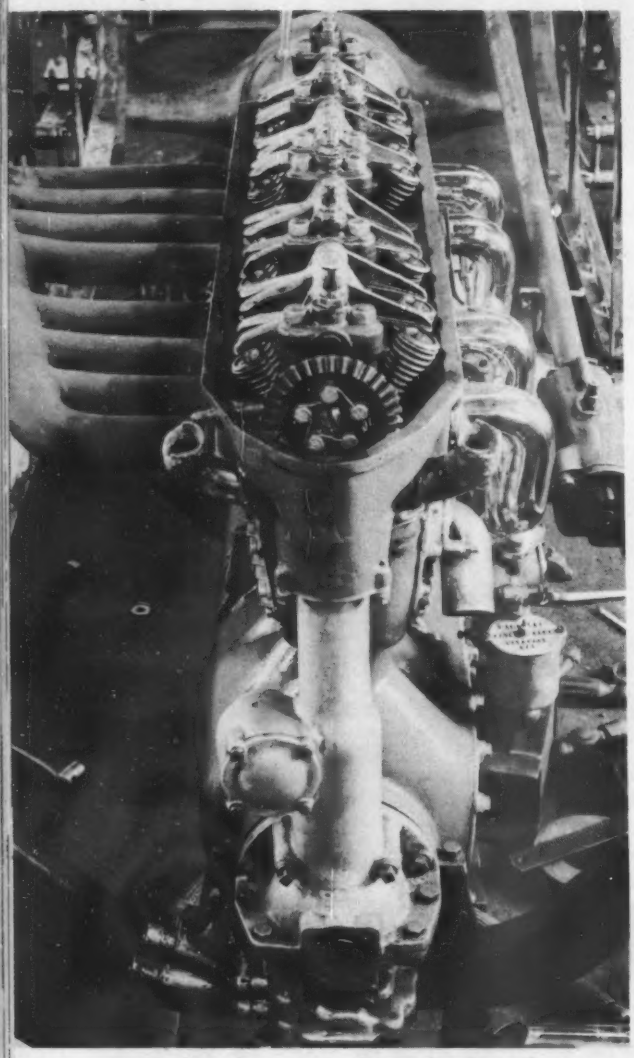
First steps in rebuilding fell to Karl Kizer, founder of an Indianapolis machine shop operating under the name of Century Tire Co. Kizer's background as riding mechanic with Earl Cooper provided the impetus for him to jump into the program with both feet. He began by hoisting the heavy, cast iron straight-eight out from between the frame rails and turning it over to former Duesenberg mechanic, Thane Houser, for disassembly.

Preliminary examination revealed things could have been a lot worse, because it looked like breathing life back into the early-day bomb was well within the realm of possibility.

The only American car to win a Grand Prix, the fabulous Murphy Duesenberg was rusting away to junk. Now it's back in fighting trim.



Jimmy Murphy flashes across finish line to win 1921 French Grand Prix. Both the left front and right- rear tires were going flat, and the Duesenberg had a hole in the radiator.



This is famed Duesy single overhead cam layout, showing valve and rocker arm placement, bevel gear, vertical drive shaft for cam, water and oil pump at bottom of the shaft.

The engine derived its power from a displacement of 181.5 cubic inches. Bore and stroke broke down to 2½ by 4⅝-inches. And horsepower was rated at 125. This doesn't sound like much, but with 7 to 1 compression ratios and gasoline which almost could pass for kerosene, such a reading was doing pretty good.

The detachable cylinder head sported a single overhead camshaft, with valves opening into a hemispherical combustion chamber. Inspection of the head and valve assembly revealed a work of art which would be considered good design even today. The inner surfaces had no cracks or fractures, so the overhaul was held to making six new 1-9/16-inch intake valves and seating all the others.

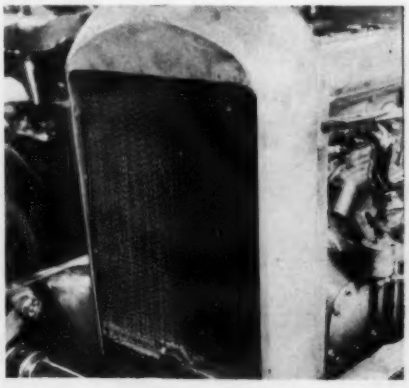
The Duesenberg brothers were great believers in providing clean scavenging, thus they developed a head containing two exhausts and one intake valve per cylinder. Steel casting rocker arms were double fingered for the exhausts and had a single finger for the intake. Valve lift, which to some extent was an unknown quantity, was figured at approximately 40 per cent due to a three inch finger length and a 1¾-inch cam follower length.

The cam drive and lubrication system checked out in good order, with the cam being driven by a front mounted vertical drive shaft via upper and lower bevel gears. The oil system was a dry sump type operated by an oil pump interconnected to a water pump at the bottom of the shaft. Pressure lubrication moved the oil through the front cam bearing and drilled rocker shaft, with the drainage returning it in troughs grooved to flow the lubricant over the bevel gears. Drainage also took place through a tube between No. 4 and No. 5 cylinder.

The bottom half of the engine required more attention, and Kizer's shop crew took special pains with the crankshaft. The three main bearings for eight cylinders would make the hair of a modern design man stand straight on end, so the elongated steel shaft was subject to minute scrutiny for possible fractures in the metal. The crank was reground, the mains line-bored, and the front and center mains given new babbitt. The rear, which takes a huge ball bearing with a seven inch overall diameter, was replaced with bearing #6220.

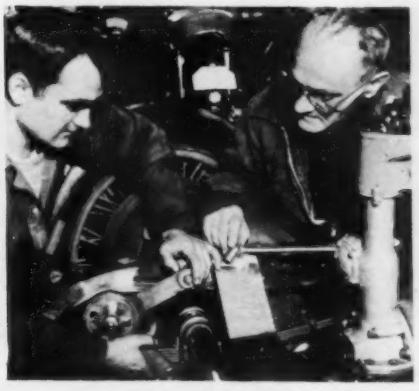
One spot on the left hand side of the case showed evi-

This radiator shell was fabricated to take place of Miller grille that was stuck on car.



Ball bearing is rear crankshaft main. Disc is outer coupling of thermoid type U-joint.

Floyd Dreyer, Jr., left, and his father worked for three days to position shock absorbers.



dence a rod peeked out at some time or other, but the rupture had been repaired long before the engine was torn down, and appeared to offer no problems due to weak wall structure. Actually, this single break is nothing short of amazing inasmuch as the tubular connecting rod has a center to center length of 8¾-inches. With a finned lower end for a wide journal surface area, the rod, aluminum piston, and steel pin assembly weighed 2¼-pounds. Finishing touches were put on the block by installing two new cylinder sleeves. Then the multitude of parts were turned back to Houser for reassembly.

The outfit that was handed the man-killing assignment of the whole reconstruction project was the body building team of Floyd "Pop" Dreyer, and his son, Floyd Jr. When the wreckage was plopped down on the floor of their spacious shop. Pop kept circling the machine like a wary boxer looking for an opening. Finally, he just stopped dead still. It didn't make any difference where he started, everything was equally bad.

In order to restore the chassis to its original condition, the job practically called for building a Duesenberg race car. The automobile could bear two dates, one when Fred and Augie built it, and one when the Dreyers built it.

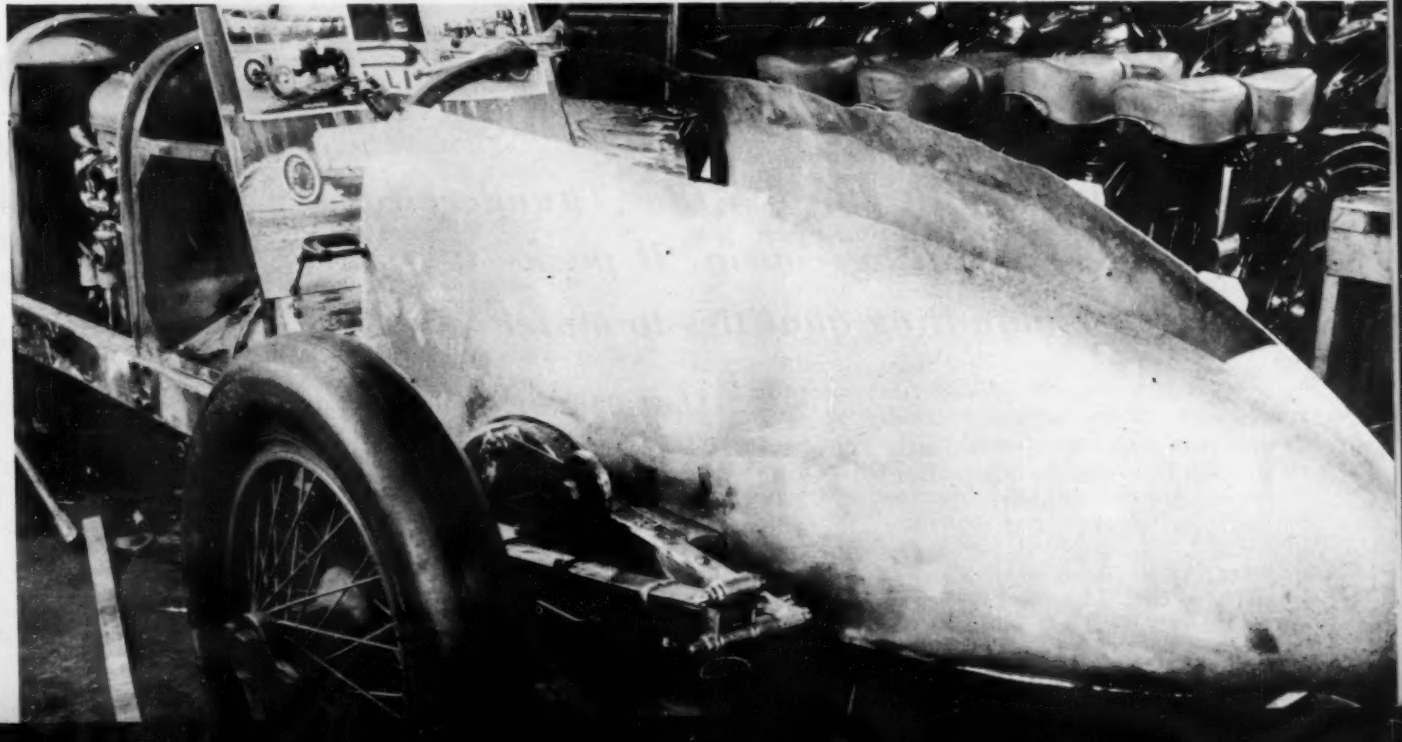
Father and son began operations by stripping everything down to the frame to get a better look. The frame had been made up in the form of steel rolled channel, with a quick survey showing that front horns and side rails were bent. It became necessary to reshape the horns to handle the parallel elliptical front springs and to reshape the rails so a repositioned cross member could properly accommodate the Duesy engine. Work on the rear of the chassis entailed removing the springs from under the rails to their original outrigger position. It also was necessary to weld new mounting brackets to bolt on the Hartford shock absorbers.

An entirely new radiator core and water tank, plus the necessity of creating a new Duesenberg radiator shell, started Pop off on what was to be a long, tedious body building program. The car was delivered in Indianapolis still retaining the Miller shell that Murphy had hung on it when he dropped a Miller engine into the chassis for the 1922 Memorial Day classic. The Miller long since had been replaced, but the grille piece still remained through the aid of some bent screws and considerable good fortune.

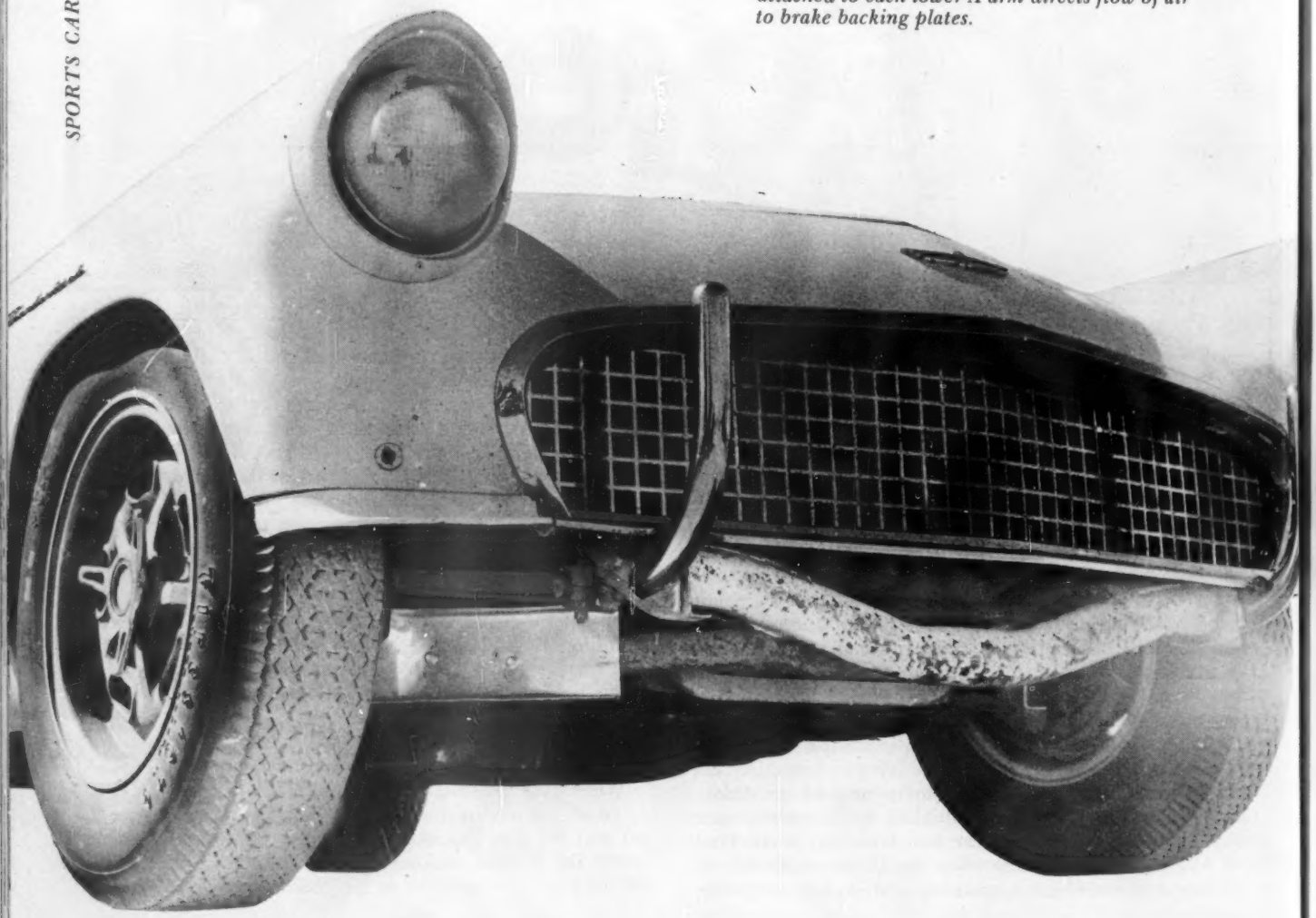
When Pop tossed it aside to build the shell, he decided to go all the way in constructing a new hood, cowling, cockpit and tail paneling. Also needed was an oil tank, located under the floor of the cockpit, and an underpan to enclose all the lower cockpit fittings. The body was so badly cut up

(Continued on page 65)

Tail piece, other body sections were made by referring to photos of the original car.



Beefed-up front end had unusual splined anti-sway bar that could be adjusted to favor one side or the other, and provide necessary reaction for severe cornering. Channel of aluminum sheet attached to each lower A arm directs flow of air to brake backing plates.



FORD'S 400 HORSE T-BIRDS

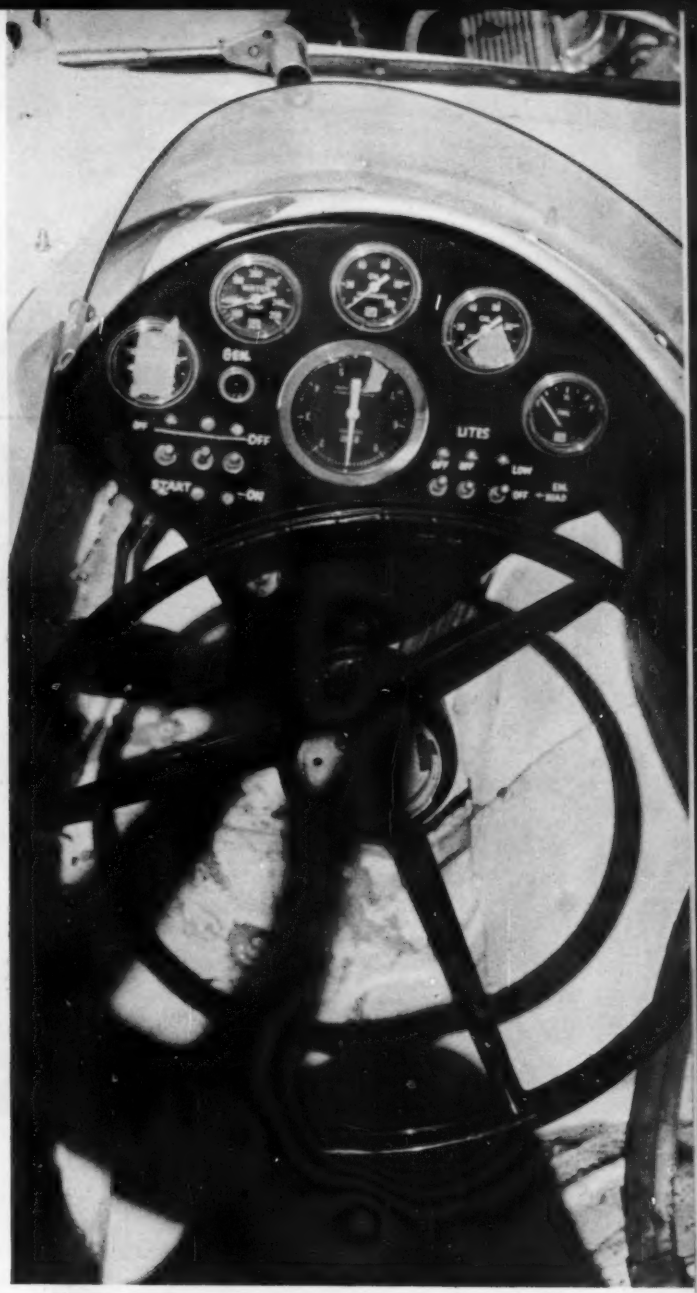
Meet the "Battle Bird", the Thunderbird's fighting cousin. It packs 400 horsepower and boasts handling qualities to match.

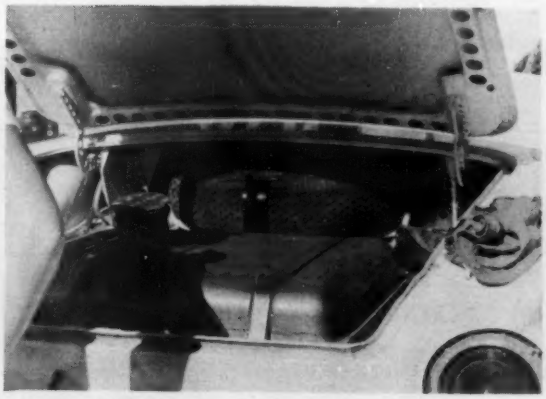
By WILLIAM CARROLL

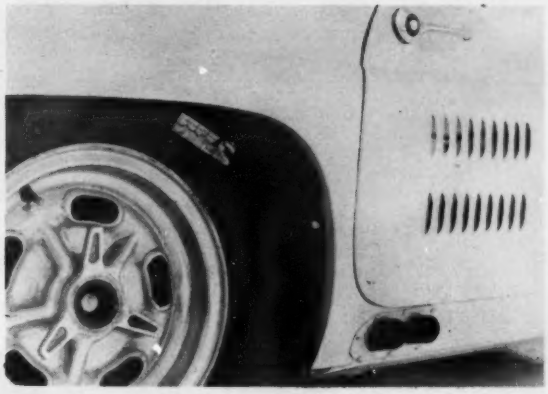
T-BIRD lovers at Daytona Beach a few months ago were treated to the first public display of two experimental "flivvers" that might represent what's coming up for '58. Usually hidden in a police guarded garage behind an unclimbable wire fence, these two white, highly-modified Thunderbirds were as restricted as Marilyn Monroe's girdle. A mob-like pit crew surrounded the cars at all times, seldom lifting a hood or deck to permit inspection by the throng of curious. But S.C.I. got the story. By asking questions and shooting dozens of pictures we got the details shown here.

The two Thunderbirds were "built" by Frank Coons and Jimmy Travers of Los Angeles, California. Sent to Daytona Beach for NASCAR Speed Weeks, they were stabled with

Instrument panel on both cars included fuel gauge, two oil pressure recorders, water temperature gauge, and a tachometer installed upside down with piece of tape marking 6000 rpm. Toggle switches are for lights. Passenger car steering wheel is used instead of a racing type.







TOP: Not only were frames of hood and deck punched out, but interior structural members were lightened as well. CENTER: Huge Firestone Super Sports racing tires and Halibrand magnesium wheels completely filled wheel housing of each car. Exhaust stubs were ducted between body and frame; door louvers cool driver's feet. BOTTOM: Seven leaf rear springs are mounted on shackles which could be adjusted for height.

Peter De Paolo's fleet of Ford competition stockers, and referred to in local newspapers as "Ford's Thunderbirds."

Dimensionally, they are true 'Birds, with a basic frame and body shell. But brother, that's all that came off the assembly line. The body was completely gutted, the entire dash panel removed and replaced by a lightweight cluster of readable pressure, temperature and rpm indicators. The passenger section is completely covered by an aluminum cowling, leaving room only for the driver's head and shoulders. Two fuel tanks are used, the regular tank plus another almost filling the trunk area. The 12 volt battery is in the right rear fender, accessible by lifting the deck lid. A spare tire fits on the rear axle hump between driver and trunk compartment gas tank. Lightness must have been a prime objective, for all body, hood, deck lid and cowl stiffeners are moth-eaten with super-size lightening holes. A full length belly pan, used for straight-away runs, was removed for road racing to eliminate heat problems.

Chassis modifications include installation of a huge splined front torsion bar, with adjustable arms nailed to the lower A member near the ball joint. Front suspension coils

Ford-powered T'Bird ran in sports car race without belly pan or blower, but with fuel injection.

appear to be of Lincoln parentage—or Mercury at the very least. Rear suspension is by semi-elliptic leaf springs beefed up with an uncommon number of leaves tied to height adjustable rear shackles. Halibrand rear ends, installed in both cars, forced notching of the 'Birds stock gas tank to provide adequate clearance. Cross finned brake drums (2½" shoes) are fitted all around, with Halibrand magnesium knock off wheels. All this unsprung weight is capably controlled by pairs of heavy duty tubular shocks. To minimize fade, rear brakes are cooled by heater blowers forcing air through flexible tubing to the backing plates, a la Mexican Road Race Lincolns.

For the chauffeurs (Troy Ruttman, Johnny Eames, Chuck Daigh, Curtis Turner, Marvin Panch), there is only a nearly weightless, thinly-padded aircraft seat and wide web positive lock seat belt. Neat at hand, well back in the car appears the stub of a four speed Jaguar transmission, apparently selected by Ford engineers as a good representative stick shift. Steering is fantastically light and quick, only 1½ turns lock to lock. The Lincoln engined Bird uses a hydraulic clutch setup, while the other car has a mechanical linkage arrangement.

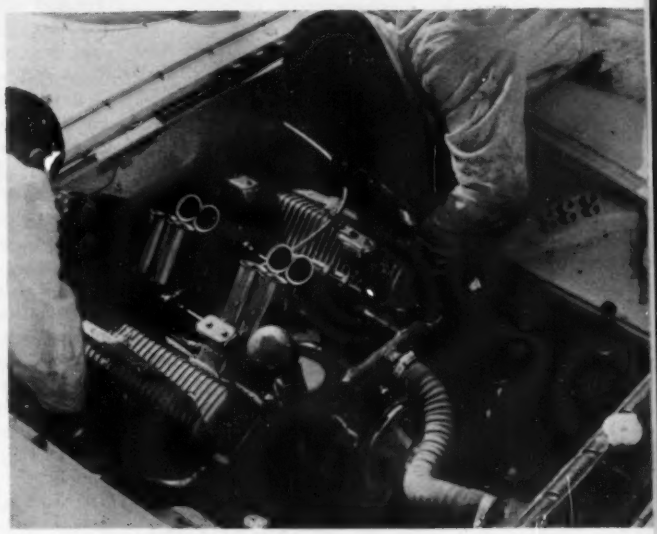
Under the hoods, these rare fowl are alive with startling experiments. One car carries a Lincoln block—the other a Ford 312 cubic inch hunk of iron. Each engine is moved back six inches and lowered approximately four. Both have Scintilla ignitions, Hilborn fuel injectors, no fan, T'Bird radiators tilted well forward, extractor type exhaust headers, and special cylinder heads which might just be undergoing tests for 1958 production. Compression ratios are a modest 10 to 1 except during an early test run. It seems the engineers wanted 15 to 1 compression, blown—and injected. It was tried. It blew.

Underlying every modification of these unusual cars is care and attention to weight distribution, as witnessed by relocation of the battery, dual fuel tanks (more traction?) plus the "way back", lowered and offset engine. It seems possible that Ford is serious about giving the Corvettes a hard time next year. And if they do—it will be the result of findings made during these first tests at Daytona.

Performance wise — the 'Birds were little short of being domestic Ferraris. On second thought they should have been —for each of these finely-engineered cars must have cost nearly $20,000.

In their first appearance on February 9th, the official Two-Way Flying Mile Speed Runs—for experimental cars, the Fords (?) gave startlingly different performances. The blown injector Lincoln T'Bird blew up its engine and was listed thusly: "Not recorded as an official run." All 400-odd horsepower had been frittered through the crankcase

Another view of rear spring setup shows ported fin brake drums which contributed so much to the success of these cars. Tires were so large that they wore into body paneling at several points.



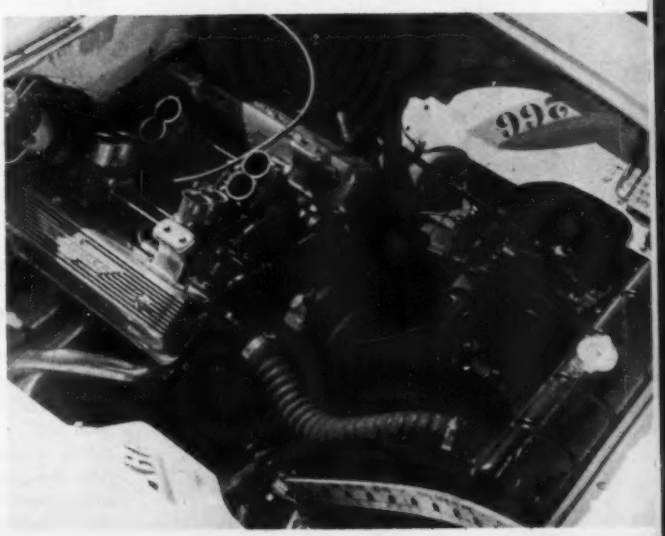
RIGHT: T'Bird sporting Lincoln block engine appears similar to that with Ford block, shown below. Both have fuel injection setup with long ram tubes to improve torque characteristics at upper end.

breather pipe. However, the Ford block 'Bird, driven by Danny Eames, made a one way scat of 153.126 mph, only .327 of a mile slower than the winner.

Several days later, Danny Eames copped the acceleration tests with a 98.065 mph burst in one mile—from a standing start. This was done with the Lincoln block 'Bird *running in third gear*. Chuck Daigh took third spot with the Ford engined 'Bird by dragging a 93.312 mph mark out of the electronic timer.

Both cars were then entered in airport sports car races—but the Lincoln mill just couldn't be made a solid sender. At that, it had been qualified by Curtis Turner at 79.852 mph, with Marvin Panch bringing the Ford 'Bird around at 77.419 mph. Belly pans used for qualifying were removed for racing the following day. Come race day, Panch gunned the Ford 'Bird (as No. 98) to a thrilling second position behind Carroll Shelby in a 4.9 Ferrari. This time the undernourished 'Bird was only injected, with its blower left at home to cool off.

In spite of the secrecy attempts, pictures were made of the cars, during refueling, tire changes and minor engine adjustments. Then in the white heat of road race battle, caution was finally thrown to the winds and we were able to accumulate additional photographs to detail these unusual cars for SPORTS CARS ILLUSTRATED readers.



Everybody Had Power

(Continued on page 27)

was that the prototype had a standard injection setup, while the blue SS had the air metering valve mounted facing forward, connected to the cleaned-up plenum chamber by a cast elbow. A Fiberglas duct fed the valve with cool air from the low snout. Other than the possibility of different compression ratios, there was little else to choose between the engines.

Both cars had ducted air flow through aluminum-core radiators, plus extra header tanks and special water pumps. In spite of this the "bucket of bolts" had endless trouble with overheating and loss of cooling water, all kinds of hose rerouting and pressure measurements being tried to no avail.

Pollack, 200SI Maser briefly led Class E.

Horsepower of the blue SS as raced was probably a hairy-legged 310 horses, and being about 100 pounds lighter than a D Jag it had no trouble at all with that team coming out of the corners. Acceleration was slightly better than the 3.5 Ferraris and about par with the 3.8's, which weigh about 1950 pounds dry. It couldn't, of course, hold the 4.5 Maser though, and Fangio and Moss, used to this car, found the SS acceleration very good but not as staggering as they had expected.

Everybody had power down there, but Maserati had more than most. They had the good sense to back it up with phenomenal brakes. Maser practice has recently been to use drums of moderate width but great diameter, and the binders on the 4.5 take this to an extreme. The rear brakes literally fill the insides of the 16 inch wheels, while those at the front are much bigger than the rim and are completely offset into the oncoming air stream. This was a practical, hard-headed way of meeting the problem and was an immense success. Only Behra ever extended the 4.5 in the race, and that in the early hours. The rest of the run was easy but the brakes were *always* there if needed. This was good planning, but the masterly move was equipping both three liter cars with these huge brakes. As a result there was no question of fade on these cars. When Moss stepped up the pace at the eleventh hour to take second from Hawthorn's D-Type, he had all the stopping power that he started with. Had the V-8 not lasted, Ugolini could well have won with his remaining 300S.

There was one error. The Maser designers felt that the lighter 300S would need less braking force than the 4.5, so the three-liters had a lower mechanical advantage between master cylinder and wheel cylinders. Both Moss and Shelby complained that pedal pressures required were much too high, as a result, and Carroll had a numb right foot after three hours in #21. Maserati may go to servo assist.

Jaguar's highly controversial disc brakes were overhauled by Dunlop for 1957, to include a quick-change lining feature for the front wheels only. The calipers are much simpler, having one pair of rectangular pads instead of three round pairs. Unlike some similar efforts this was specifically designed for quick pad removal, and the locking pin and withdrawing setup is very neat. To retain heat until it can be dissipated, the disc thickness has been increased from ½ to ⅝ of an inch. The resulting five pound increase in disc weight is balanced by the five-pound-lighter caliper assembly. The Momo-prepared cars also had front brake hoses wrapped with asbestos to reduce the chances of vapor lock, a trick they learned in '56.

These efforts allowed the Jags to finish the race in reasonably good shape, in contrast to last year, but brakes are still the weak point. Pads were changed on injected #5 at the mid-race point, and on the Hansgen/Boss #7 just before the end. The latter car didn't press the binders much, but Hawthorn and Bueb used theirs up fast, and during the last two hours Mike's car had only one functioning rear brake. He had no way of fighting off Moss' steady advance. The improvements have helped, but the ability of the drum brake to store heat still scores on tight courses.

Brake design at Ferrari has been influenced a lot by the layout on the ex-Lancia Grand Prix cars, which emphasized width and kept the diameter within the wheel. All four Sebring cars had front drums of twice the previous width, very closely patterned as to finning and mechanism after the Lancia. Resulting area is very high, but all but a fraction of the drum is shrouded by the wheel and the venting system is not so highly developed as that in the Maserati. Cooling wasn't critical with the open-wheeled Lancia, but it turned out to be in the heavier more potent 3.8 V-12's, with their surrounding bodywork. Collins was the Ferrari pacesetter, in a 3.8, and by the time he was through with his first stint at the wheel his car was virtually brakeless. The same fate hit the other team cars, and here also the required pedal pressure was very high, driver suffering being considerable. Hydraulic servo systems were to be fitted to all cars just a week after the race. This will be an absolute necessity if, as rumored, aluminum linings continue to be used in the 3.8's. Lack of stopping power was the biggest single reason for the poor Ferrari showing.

With only six months to design and build a new race car, Chevrolet needed bigger and wider brakes in a hurry. The choice frankly fell on the 12 x 2½ inch Chrysler Center Plane mechanisms, as used in 1956 Chrysler products. Only Chrysler parts remaining were the shoes, cylinders and shoe pivots and retractors, linings being the segmented Cerametallic type as pioneered by Chev for automotive use a year before. The moly-sprayed aluminum drums didn't work out, as expected, and the final drums were basically cast iron with cross-finned aluminum muffs. On the more conventional Corvettes a bimetal drum was tried which had air venting holes drilled right through the braking surface. This is good in moderation, but the boys overdid it and the drums cracked up. Those cars had to settle for aluminum-painted cast iron drums.

One of the SS development bugs was an apparent lag between pedal application and brake response. After theories of inadequate line and vacuum capacity were discarded, the binders on the prototype finally wore in during Thursday's practice. It devolved that only the tips of the linings touched the drums at first, and that the flexibility of the shoe itself was responsible for the "delay".

All seven Corvettes at Sebring (four race, three practice) were equipped with a new and very clever device for limiting the amount of rear wheel braking force and thus preventing locking of the rear wheels. This was developed by an independent GM supplier, who unfortunately doesn't want to be identified at this time. They were kind enough though to describe and demonstrate the unit to us in detail, but we haven't room here to go through the whole thing. Basically, there are separate vacuum servo cylinders for the front and rear systems, the front being directly connected to the pedal and the rear being independent but operating sympathetically with the front servo cylinder. When braking effort reaches a certain percent of "g" deceleration, an angled mercury switch makes contact and instantly isolates the rear servo cylinder. From that point on rear braking remains the same while that in front can increase as needed. The angle of the mercury switch can be varied to compensate for brake, tire, road surface and weight distribution changes. It was a boon at Sebring, on the SR2 and the coupes, and is without question the most original feature on the SS. We can look forward, after this successful tryout, to seeing it in more conventional Detroit machinery where it is badly needed.

As we mentioned, cornering and driving are not critical at Sebring, and the feeling was that the 4.5 would have won even with Mutt and Jeff at the wheel. Neither Behra nor Fangio were pressing it in the corners; they would just soft-shoe through and then STAND on it. The chassis layout isn't new to Maserati, though the deDion tube does run behind instead of in front of the new rear-mounted gearbox. Like the three-liter cars, the 450S understeers but can be broken away and controlled at the rear by either throttle or steering wheel. Doing it with the throttle is helped by the nearly-locked ZF differential. The Moss/Schell car 20 had an early frame with big lower tubes and a smaller-size truss framework above, but was rebodied in the latest "gilled louver" style. Upper and lower tubes in car 21, for Shelby/Salvadori, were of equal size, but bodywork was 1956 type, or as sold to private owners.

The D-Jags still understeer so much that the tail must be broken loose for slow corners, and this looked like a hairy operation at times. Well-known Indy and sprint car handler Pat O'Connor had a ride in Jack Ensley's new D, as did Sweikert last year. Like most other U. S. professionals, Pat tends to go very deep into the

(Continued on page 52)

Horses

(Continued from page 17)

The need to hold upper limits on gas speeds points up the demand for huge ports and valves to match. Similarly, the critical port diameter is provided by the narrowest section, and as seen above there's no chance to make up by enlarging other parts of the port. This makes us question certain Ferrari and Maserati layouts which feature ports tapered sharply toward the valve. This would place the critical cross-section right where it's least needed: at the valve seat. The laws of fluid friction are severe, in that a one inch port has 2^5 or *32 times* the surface friction from turbulence found in a two inch port.

Excessive turbulence at the valve could shut things right down, and this seems to have been the case with the 4.4 liter Ferrari six at Indianapolis. Apart from slovenly preparation, even with the lowest feasible gear the engine wouldn't rev over 6100 on the straights. Fitted with a short, open Hilborn injector, each port was most restricted right at the valve seat, where nominal gas speed was reaching 250 feet per second at the above rpm. This killed intake efficiency, not because of its magnitude but because of its location. The sports version of the 4.4 got away with it because its carburetor venturi took the initial blow and prevented all the turbulence from boiling up right at the valve.

The 1500/RS Porsche and the Lancia and Mercedes-Benz Grand Prix engines demonstrate among others the value of a huge port with a uniform diameter throughout, or at least with the narrowest point some distance from the valve. The new BRM engine may also fall in that category.

INTAKE TUNING

One of the most talked-of modern techniques is known as intake tuning, and this trick in particular demands a separate induction system for each cylinder. Simply put, intake tuning or "ramming" takes full advantage of the pulses or waves that travel back and forth in the air column before the valve. Each pulse begins at the valve when it opens during the suction stroke, and in the form of a low-pressure wave it travels toward the atmosphere. In the open such waves travel at the speed of sound, but their speed decreases inside a pipe and lessens further the smaller the pipe and the colder the air. A rough value is 1000 feet per second, so it can be seen that this has nothing to do with gas velocities.

When the depression reaches the outer end of the intake pipe it's reflected by the atmosphere in the form of a positive pressure wave, which returns to the valve at the same speed. The designer's job is to set the pipe length so that the pulse will return just as the valve is opening again. If he turns the trick that pulse will not be wasted and the engine will get the full benefit of its suction efforts.

Since the intake pipe length usually remains constant and the time from pulse to pulse depends on the rpm, an engine can be ram-tuned only for a very narrow band of revolutions. Tuning can thus be used either to augment an existing high-output point, such as maximum torque or peak horsepower, or it can bolster a low point in the power curve. The necessary lengths can be calculated from the rpms involved, and Colin Campbell has already done much of this work. His distances, which follow, are measured from the open pipe end to the centerline of the piston crown.

rpm	length, inches
3000	31
4000	23
5000	18½
6000	15½
7000	13½
8000	11½
9000	10½
10000	9½

To illustrate, the Mercedes 300 SLR engine reaches its torque peak around 6200 rpm and its horsepower peak nearer 7500. The straight length of its big inlet pipes is about 14½ inches to the cylinder centerline, which corresponds to 6500 rpm on the chart. This is clearly not a coincidence. Be it noted also that in 1954 the W196 engines ran with intake ducts curved down from an air box near the intake camshaft. A major 1955 change was the banging out of the bodies so that air could be given a die-straight run down from a relocated air box. Didn't look as nice, but what an air consumer!

Intake tuning only works well and consistently if the intake system is free from bumps and crannies which tend to damp out the pressure waves. Such obstructions only hamper the effectiveness of tuning and heat up the incoming charge slightly. Consistently large ports minimize turbulence and help out here just as they do in the case of gas velocities. Also, the well-known flared outer pipe end smooths out the air flow at that point and can up the output of a hot engine by as much as two per cent. The biggest offender, though, is our old friend the carburetor, which deserves a section to itself.

CARBURETORS

It's a wry reflection on the ways of racing that fuel injection appeared and was proved on the circuits a full three years ago, and yet remains the object of grudging mistrust on the part of most Grand Prix designers. Credit for this state of affairs must go to the carburetor manufacturers like Weber and Solex, who have moved rapidly to keep pace with engine developments.

Instigated largely by Ferrari, Weber's biggest step was the perfection of carb systems to provide a separate choke for each cylinder. This done, they were rid of the shackling meanderings of manifolding and could concentrate on air flow and metering. Right off the bat, this cut out the biggest single "advantage" of fuel injection, for equal distribution and intake tuning effects could now be obtained on carbureted engines.

One rough problem remains, though, that will always call for compromise. To keep up volumetric efficiency through low ... speeds calls for the least possible restriction at the carburetor venturi and a very low pressure drop at that point. Some authorities feel that the venturi area should be not less than 88 per cent of the inlet pipe area, and most agree that angles of incidence should be low and the throttle valve smooth or non-existent.

A low pressure drop is easy to get but severely limits the carb's chance to provide the correct air-fuel ratios up and down the speed range. Low maximum gas speeds ensure power at the top end, but can mean poor middle and low rev performance if mixture correction features are sacrificed. This is almost inevitably the case if the designer has only a small pressure drop to work with, for it's this that supplies the power to operate his compact hydraulic system.

Ever since motorcycles began, the old standby of the special builder has been the Amal carburetor, which sacrifices everything short of its self-respect for top-end power. Little more than a constant-flow port injector, it has a vertical slide throttle that's completely out of the way when fully open. For maximum output it's hard to beat, but there's usually very little in the bottom two-thirds of the range. An incidental problem is the tough conversion to the very different operating conditions of the automobile.

At the other extreme lies Solex, whose technicians have been the latest to plunge into the racing field. Their horizontal and vertical competition layouts have made a lot of progress in the last few years, but since they retain the excellent air correction system of their production units they can't pass quite so much air as their competitors. For proper fuel metering, though, they're among the best in the business, and Solex carbs are the most tractable that can usefully be fitted to a racing car. Once set, also, they remain in adjustment indefinitely.

Webers have compromised to best effect, in that they compensate better than the Amals while passing more air (or allowing lower velocities) than the Solexes. Moreover they're available in sizes that Amal never dreamed of, their 2.28 inch bore for Ferrari 553's and 750's being the top yet recorded. Many early experiments were carried out with single-choke units, such as the 45 mm Webers that fed the first Ferrari four in 1952. Once the operating conditions were known, twin-choke assemblies were laid out to share a common float chamber. Webers have an edge here too, by the way, since their float chambers keep fuel at the jets even under extreme cornering loads.

Vibration of the four-barrel Ferraris brought up some fuel frothing problems, and the early versions carried thick rubber blocks bolted between the carburetor and head flanges.

A strong sign in favor of Solex equipment is its continued use on the Ferrari-modified GP Lancias, after testing during the winter of '55 had reputedly yielded more horses from Webers. They may be reaching for low-down power, which is weak in these cars, and initial Lancia development was also carried out with 40 mm Solexes.

To be continued next month

Skull Busting

(Continued from page 23)

note are those of the Road Research Laboratory, the Royal Air Force in England, and the Institute of Transportation and Traffic Engineering of the University of California at Los Angeles. In the field of establishing standards, the British at present are well in the lead, for in 1956 a revised set of standards was published which established criteria far superior to any used here, including those used by the U.S. Air Force for the protection of its pilots.

The Snell Study Plan was set up to cover several phases of helmet testing, the first of which has now been completed. This first step was designed to compare the efficiency of protection provided by the more popular brands of helmets on the U.S. civilian market against a single, severe impact. This was a "maximum stress" type of test, deliberately set to approximate the upper limits of impact force at which if the *head* could be protected, survival might reasonably be expected. This type of test was selected as the first step in order to as quickly as possible eliminate the need for further tests on those helmets which were found to be grossly inadequate, and of use only in protecting against minor, uncomfortable blows.

The test impact thus chosen was set to provide 500 ft. lbs. force, determined to be that incurred by an "average weight" head (and helmet) mass striking a fixed surface at a velocity of approximately 34 miles per hour. The test further differed from studies done elsewhere in two respects. Firstly, the site of impact was selected to be the *temple* area; this was chosen after analysis of both American and British accident statistics had shown temple blows to be both more common, and even more important, more apt to be fatal than blows in other areas of the skull. Most tests previously have used the crown of the head as the test site; blows here are not only less common but also far less often of serious nature in actual accidents. This is demonstrated in photograph #1, of a helmet actually worn in a fatal accident.

Secondly, the test procedure differed in that the helmets were tested on human cadavers. This made possible a much more reasonable comparison with actual accident situations than if a rigid, "artificial head and neck" were used, since it was felt that the resiliency of the human neck structures might well be an important factor in the cushioning of blows. This use of a cadaver head also made for a readily measurable end result, since both direct examination and X-ray of the skull for fracture could be used to determine the effect of the impact.

Photographic records were made of both the helmets and the skull X-ray after impact; these demonstrate better than many pages of written description the lack of protection provided by all but one of the helmets. The helmets were then taken apart and their constructional characteristics tabulated, as indicated in the accompanying table. Obvious defects determined from this examination are also included in the table.

Of special interest are the very severe fractures shown in the X-ray of the Gentex helmet test. These result from a feature of particularly poor design—the use of the projecting wingnut and bolt and small wooden stop block used for the face shield. Such projections served to concentrate most of the striking force onto one small area, preventing its distribution, and allowing a far greater force per square inch to be developed than any helmet could possibly withstand.

Also worthy of note is the complete lack of protection offered against fracture by the Cromwell helmet, as shown by the very severe fractures in the X-ray, even though the shell of the helmet itself remained unbroken. This is an excellent demonstration of how impact forces may be transmitted through the shell, without significant change in the shell itself, when there is no energy-absorbing liner material utilized. Similar "protection" might be gained by the old-fashioned leather helmet used years ago.

The most dramatic protection in all of these tests was provided by the Toptex helmet. This could not be attributed to a superior shell, for its shell did not differ significantly from the other Fiberglas shells. The vital difference lies in the use of a unique type of *liner*. This was the only helmet to use a completely *non-resilient*, energy absorbing type of liner material, which absorbed rather than transmitted most of the impact force.

The use of such a non-resilient lining material is felt by the Snell Study to be of the utmost importance in protection against severe impact, both from theoretical considerations of basic physics and from the practical demonstration provided by these impact tests. This type of liner, utilizing the principle of energy absorption, has now been recognized by the British to be markedly superior, and is the type which their recently revised standards recommend.

As a result of this first phase of the Snell Study, it became immediately apparent that no helmet available on the open, civilian market could completely meet the minimum standards required. (The Toptex helmet, which passed the impact test with flying colors, was a police motorcyclist model, and was fitted with an inadequate chin strap and fastener.) These findings were made available to the manufacturers who had cooperated with the study, and have evoked extreme interest on their part. One of the manufacturers immediately stopped production of the model tested, and both that firm and several of the others are now working on a new type, incorporating improved design features, particularly that of a non-resilient type liner. Several such pilot models have already been submitted to the Snell Study for further evaluation.

With these improved models the next phase of the Snell Study plan will begin. This will include measurement of acceleration of helmet contents after blows of known magnitude using electronic recording apparatus, tests to measure abrasion resistance and penetration resistance of the shells, and measurements of strength of head harness, chin straps and fastening devices.

This cooperation on the part of most of the American helmet manufacturers has been one of the most gratifying features of the entire testing program thus far, for it expresses in the best possible way the desire of all concerned to make less likely the repetition of the type of accident which started the Snell Study on its way. With such cooperation, it would be reasonable to expect that a far superior type racing helmet will soon be available for the racing driver. If this stirring up of a storm by the friends of Pete Snell can attain such a goal, the Snell Memorial will indeed have become a living tribute.

—Dr. George Snively

HELMET	McHal	Bell	Anderson	Gentex	Toptex	Cromwell
SHELL type	Fiberglas	Fiberglas	Fiberglas	Fiberglas	Fiberglas	pressed fibre
thickness	.075-.125"	.110"	.125-250"	.052-.135"	.070"	.190"
LINER type	resilient	resilient	resilient	resilient	non-resilient	resilient
thickness	3/4"	13/16"	1/2"	11/16"	1/2"	1/4"
HARNESS material	cotton	nil	cotton	nylon	cotton	cotton
attachment	stitching	nil	rivets	rivets	cement	stitching & cement
CHIN STRAP attachment	rivets	rivets	cement & stitching	rivets	rivets	cement & stitching
fastener	buckle	buckle	buckle	buckle	snap	buckle
COMMENTS	inadequate liner; should rivet harness	inadequate liner; should use harness	inadequate liner; should rivet chin strap	inadequate liner; should remove surface projections	excellent liner; should improve fastener on strap	inadequate liner; should use fiberglass shell; should rivet liner & strap

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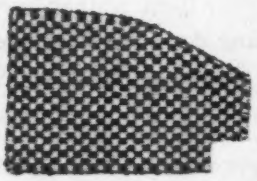

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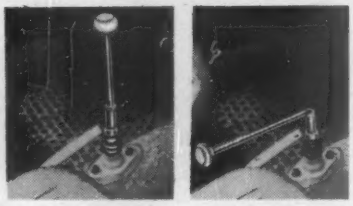

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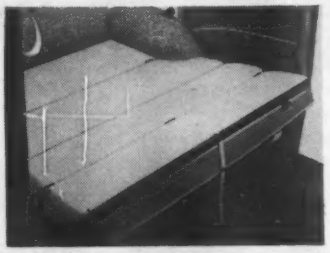

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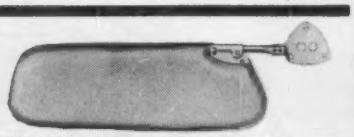

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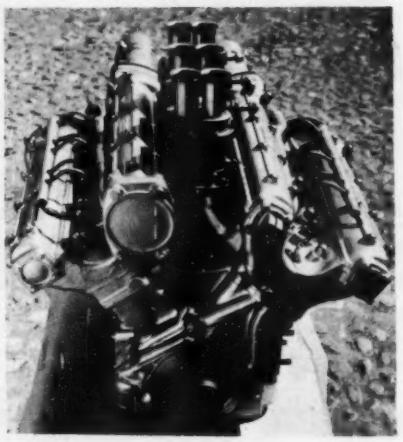
under the hood



This little bundle promises to be one of the hottest engines per inch and per pound that's come along in many a moon. It's Ferrari's new 91 cubic inch *V-6* for international Formula II racing. Output claims for this engine have verged on the fantastic, and Ferrari still claims the rumored amount: 190 horses! The fly in the Sta-Lube, gentlemen, is that these are "CV" rated horses — the Italian and French dyno system which, like German "DIN", doesn't correspond directly to any of our rating systems. Even so, 175 bhp doesn't seem unreasonable, which is still a whopping lot for a 1½ liter car running on 90/94 octane fuel, as claimed.

In some construction details and, we think, especially in valve gear, this mill is like a shrunken edition of the front six cylinders of Enzo's latest 60 degree V-12 sports car engine. This picture was cleverly taken from the back to conceal some critical details, but this undoubtedly also has a roller chain drive to the four cams. Crankcase and oil passages (which stand out like veins on the back of the engine) look a lot like those of the V-8 Lancia Grand Prix engine which will be reviewed in detail in the September SCI. Twin mags can just be seen, driven off the intake cams and igniting two plugs per cylinder. This engine is yet another example of the bends in porting that are necessary to squeeze twin-throat carbs between the banks of a narrow vee.

Statistics: Bore and stroke are 2.92 x 2.54 inches (74 x 64.5 mm), displacement 1490 cc. 190 CV are turned out at 9200 rpm on a 9.5/1 compression ratio. The engine weighs 277 pounds. The car to go around it will be a lot like the Formula I Ferrari-Lancia, with rear-mounted clutch and gearbox, space frame, etc. Wheelbase will be 85 inches, will sit on 15 inch wheels. Total dry weight is to be 1130 pounds, which gives less power per pound than its English competitors, but this should unwind like a mainspring down any decent straight. Also watch for this engine in a Class F sports car, plus a two liter V-8 edition.

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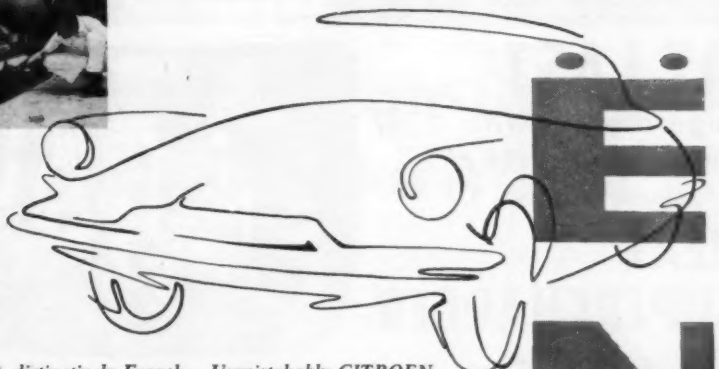

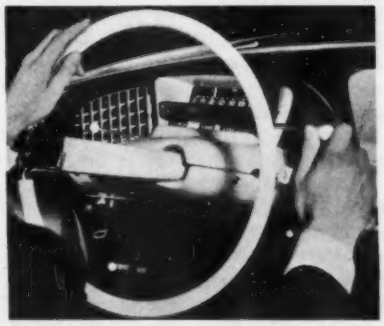

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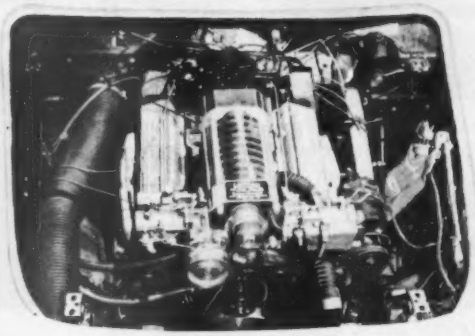

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Everybody Had Power

(Continued on page 46)

corner before swinging the helm and cutting across, a technique which demands even more understeer if the car is to come out of the bend in a clean and stable drift. Pat was happy with the D's rear end behavior, and additional understeer was put in by taking up on the rear torsion bars, which shifted weight fractionally forward. By hand timing through several of the slower corners the O'Connor/#8 combination was just about the fastest cornering D-Type, but was still not so good as any of the factory Maseratis or Ferraris, not to mention the rapid RS Porsches.

Ferraris were as quick through the bends as any team. Portago in particular was astonishingly fast and clean in the slower sections, and Collins, Musso and Hill did very well by the cars too. The twelves handle very much like the Maseratis, but are stiffer sprung (if possible) and ride higher at the rear. This year's chassis is supposedly a new design, but if so it's only a detail development over the '56 model which itself goes back to 1953. This is in line with Ferrari policy of drawing heavily on experience, which gives them a seldom-erring ability to adjust cars quickly to course. When Phil Hill was out on Thursday's practice he found that the back end tended to get out of line too soon, causing him to use up too much road in trying to hold a drift. This noted, tires and pressures were adjusted, and on Friday the Hill machine was dead on.

Sensation of Friday practice was of course the fast Moss and Fangio lapping in the SS Corvette. Suspension on this car is very light and simple, with parallel wishbones of nearly equal length at the front and a commendably uncomplicated de Dion layout at the back. Coil-cum-shock units were used all around. A lot of extra coils were brought along, those at the back being changed several times in search of the right combination. Result was that both the august handlers above thought very highly indeed of the SS' roadholding and steering response. Fangio in particular likened the car to the Maseratis in this respect, commenting that like the Masers its semi-locked rear end allows ready throttle steering when blasting out of corners. In three laps Juan had gotten his time down to 3:27.2, the best previous time in that prototype SS having been 3:33.3.

Rather than being critical, though, Fangio is known for an utter indifference to whatever happens to be under him. He just makes it go as fast as is necessary. Moss however is known for saying just what he thinks, and after the SS ride he was pleasantly surprised. After being flagged in once for a tire check he got his time down to 3:28, feeling that if needed he could lop two or three seconds off that. Stirling was initially repelled by the rough and dirty condition of the much-flogged "bucket of bolts", about which Duntov was touchingly embarrassed, while Fangio took it with a sly smile of sympathy.

The moral of this is that (A) the SS Corvette is potentially one of the fastest sports cars in the world and (B) it won't

do a bit of good unless they can sign up some Class A drivers.

In respect of strategy and preparation, the Maserati team was totally out of character. The cars arrived spotlessly clean and fresh, engines literally being paper-wrapped. Hoods were invariably closed out at the track and we never once caught them so much as changing plugs! They *did* change the final drive ratio of the 4.5 one evening, by means of the handy quick-change gear case just behind the clutch, and Daniello, Jim and Ronnie from the Westbury, L.I. shop spent a late night pounding out the nose of the 2.5 after Bonnier contacted #8 Jag and was haybaled.

Just about everybody tried every car in practice, Shelby and Salvadori settling on one three-liter. They worked the car up to sixth spot in the race and were then disqualified after some more typical heads-down pitwork. For Sebring it was ruled that only the Second Driver could switch from car to car after the green flag dropped. Keeping this in mind, and being by no means sure that the still-new 4.5 would keep running, Ugolini started Behra in the 450S and Moss in the fastest 300S. At the end of three hours Fangio would hop into the car that seemed to have the best chances, and the remaining machine would be kept reasonably high up just in case. Needless to say this worked perfectly.

Preparation of the Jags in New York was held up by late arrival of the new engines and front brake units, but otherwise was up to Cunningham-Momo standards. Factory car strategy was upset by the slow start of Hawthorn, who was to be pacesetter and buster-up but could get no higher than fifth in the first four hours—a contrast with last year! Also serious was the loss of #6 D-Type, as related. The remaining Hansgen-Boss car ran a beautifully-controlled race, going from ninth at the first hour to sixth at the half-way point, finishing in fifth place nine laps off the pace. None of the Jags seemed able to post really fast times, practice laps being around last year's 3:29 race lap record.

Contrasting with Maserati's calm certainty, the Ferrari operations at the local Pontiac garage involved many, many smiling joking people not accomplishing too much. Last year's team manager Sculatti has apparently been canned, and operations at Sebring were overseen by head of the racing division Amoratti and more directly controlled by Tavone, who was transferred from the Ferrari-building plant for this purpose. He seems to be up on the racing business and is respected by the drivers, the cars themselves appearing to give the most trouble. Plug changing on the 3.8's was a full-time operation during practice for two valuable mechanics.

Musso posted best practice time for Ferrari at 3:25.6, and with Portago was doing the best for the team by holding second, third or fourth place right up to the eleventh hour. At that point a clogged fuel line led to carb troubles, and the back two Webers were rebuilt on the pit counter in a mere 25 minutes, setting them back to seventh at the finish. Collins utterly fried his brakes in the early hours, as mentioned, turning 3:28.7 laps while trying to hold Behra. Trintignant brought it

(Continued on page 54)

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Everybody Had Power

(Continued from page 53)

home sixth at a sedate 3:45 pace. Lou Brero in #15 3.5 Ferrari did well except for a few very nasty moments out on the course due to heat prostration, and with a cool-looking Masten Gregory finished in fourth spot. Running just a place or so behind #15 was the Hill/Trips 3.5 which retired just after the sixth hour, being unable to start after a pit stop. A faulty generator and/or voltage regulator had been replaced before the race, and the new part wasn't satisfactory either.

Realizing that they had a very fast new car but an untried one, Chevy tacticians (of whom there seemed to be a couple dozen) could not hope to last the twelve hours. They did the very best they could, enlisting Momo and his portable machine shop for last-minute work and pinning and jam-nutting every possible fitting. Friday practice in the Florida sun showed up the major disadvantage of the elaborate high-curving exhaust systems, which radiated heat and was parboiling the driver. A vent pipe was fitted from the right hand door to the driver's feet and the lower body sides more drastically cut away around the "mufflers."

Optimistically, it was decided to play a planned, waiting game with the SS rather than to make an all-out run for it. Fitch got a rather late start, but after all the heavy metal had hurtled by on the first lap the SS was seen right on their tails. After a pit stop to replace tires scarred by locking *front* brakes (wrong mercury switch angle plus non-bedded linings?) Fitch was back at it, clocking 3:32.8 more than once and cutting one at 3:29.8. This indicates that the blue machine did indeed have a better power weight ratio than the prototype. At the next pit stop much time was spent investigating injection and the workings of the distributor, but this proved misspent as Fitch had coil trouble out on the course just afterward. This fixed, Taruffi took it for a while, finally bringing it in after a total of 23 laps with a collection of minor debilities including the shifting out of place of the rubber bushing at the chassis end of one of the rear suspension trailing arms.

Taruffi's reaction after this experience was that the basic car is not without promise but is now loaded with too many nonessentials to be a serious competition car. With these out of the way Racing Advisor Red Byron could get down to the serious business of going fast. After all, when practicing with the prototype is held up for two hours in order to get a man from the Styling Paint Shop to inscribe an arty "P" on the side, all sense of proportion has been lost. One interesting experiment during practice was the mounting of two ink recorders in the passenger seat of the hack stock Corvette, with inputs from the tachometer and manifold vacuum pickup. The idea was to make a "course map" of engine speed and vacuum for several consecutive laps, which would be very useful technically, but the jouncing around was too much for the recorders which went wild. Similar research could be worthwhile

SEBRING FINAL RESULTS
March 23, 1957

Position Overall	Index	Car No.	Make	CC	Drivers	Laps
1	5	19	Maserati	4451	Behra-Fangio	197
2	4	20	Maserati	2991	Moss-Schell	195
3	7	5	Jaguar	3800	Hawthorn-Bueb	193
4	6	15	Ferrari	3422	Gregory-Brero	193
5	9	7	Jaguar	3800	Hansgen-Boss	188
6	10	11	Ferrari	3800	Collins-Trintignant	187
7	12	12	Ferrari	3800	de Portago-Musso	186
8	1	44	Porsche	1498	Bunker-Wallace	185
9	2	45	Porsche	1498	Kunstle-Miles	184
10	8	28	Ferrari	1996	Ginther-Morton	179
11	3	59	Lotus	1097	Chapman-Sheppard-Dungan	174
12	18	4	Corvette	4638	Thompson-Andrey	173
13	11	47	OSCA	1492	Linton-Beck-Stetson	170
14	14	31	Ferrari	1996	de Vroom-Arents-Cunningham	169
15	22	3	Corvette	4638	Duncan-Kilborn-Jeffords	168
16	25	2	Corvette	4638	O'Shea-Lovely	166
17	19	36	A.C.	1971	Fernandez-Droulers	161
18	13	58	Cooper	1097	Hallock-Goldman	159
19	21	34	Triumph	1991	Oker-Johns-Bethel	159
20	15	55	Alfa-Romeo	1290	Kaplan-Rainville	158
21	24	33	Triumph	1991	Rothschild-Pennybacker	156
22	26	35	A.C.	1971	Dressel-Cullen-Woodbury	154
23	20	49	MG	1486	Millar-Leavens-Kieth	154
24	16	52	Alfa-Romeo	1290	Crise-Markelson	153
25	29	18	Mercedes-Benz	2996	Windridge-Red-Gilbert	153
26	31	25	Austin-Healey	2660	Geitner-Cuomo	151
27	23	51	MG	1486	Ash-Ehrman-Van Driel	150
28	30	32	Morgan	1991	Grier-Kennedy	149
29	17	56	Stanguellini	748	Behm-Haas-MacArthur	147
30	32	71	Arnolt-Bristol	1971	Cook-Burbin	146
31	28	40	Porsche	1498	Von Hanstein-Linge	144
32	27	61	Lotus	1097	Merino-Pedreira-Rosales	141
33	37	17	Mercedes-Benz	2996	Flynn-Hugus	138
34	33	64	Renault	845	Michy-Foulgoc	138
35	34	65	Renault	845	Thirion-Ferrier	138
36	35	50	MG	1486	Spitler-Kinchloe	134
37	36	66	Renault	845	Frere-Lucas	134
38	38	54	Alfa-Romeo	1290	Kessler-Comito-Rubin	42

Fastest Lap: Car No. 19, Maserati, driven by Jean Behra, laps No. 20 and 27. Identical time: 3 minutes, 24.5 seconds.

Handicap calculation by Dilworth Turner

in the future, but only after the basic car is reliable above all.

Among the smaller sizes at Sebring the Porsches put on by far the best show, taking eighth and ninth overall ahead of the Ginther/Morton Testa Rossa which itself was the best-placed two liter car by ten laps! One-two on index too was no surprise for the Stuttgart Stormers. They were all RS models, the Miles/Kunstle car being the 1956 index winner and ex-Edgar machine (chassis #3!) while the rest were brand new, all but one being privately-owned. With extreme negative camber at the rear all these cars cornered very fast, the retirement of the factory car late in the race being an unusual occurrence. The "production" Carrera was a frightening concept, having lightweight doors, plexiglas windows, special seats and other goodies plus a full Spyder engine. Class F Production race, anyone?

Entry of three Healeys patterned after the Bonneville long-distance car provided some variety, following up the running of one such car at the last Nassau meet. These all had handsome long noses and tails plus the special head and triple twin-throat Webers under the hood, but the chassis is still nearly standard. The poor old Austin A40 suspension just wasn't up to Sebring's tight corners, and the sole finishing car was edged by two laps by one of the very stock 300SL's.

Among the heavy Grand Touring iron there was a worthwhile match between a Ferrari Europa coupe and the two SR Corvette coupes. Both the Ferrari and the SR could lap in the 3:50 to 3:55 bracket, and Gaston Andre and Dick Thompson were doing very well in #4 Chevy. At the seventh hour, though, Gendebien had pushed the Europa to a three lap lead, only to retire thereafter. He had suffered in practice with rear axle problems, and the car needed a semi-locked rear end to cut down wheelspin out of the corners. The three Corvettes (including the red SR2 which had paid frequent calls to the pits) sounded robustly healthy and finished well up, 20 laps ahead of the best Mercedes. This part of the project was an unqualified success.

Other finishers included the 748 cc Stanguellini, which sounded very nice but was nowhere on index. Victory on index had been the ambitious goal of the Alfa Romeo Veloce aggregation, which did cop fifteenth and sixteenth in that category. The Renaults all finished as planned, but were not dead last as expected thanks to lengthy pit stops by other competitors. Triumph, Morgan, A. C. and MG were able to display their wares to good advantage also, the latter copping team prize yet again. There was some attrition among the Loti, but the Chapman-guided 1097 cc car did get third on index, second in Class G going to the ex-Le Mans Hallock/Goldman Cooper.

As always Sebring has upheld its reputation as a car-breaker, which only points up the stamina as well as the speed of the new 450S Maser. It has shown Chevy how far they have to go with the SS, and has undoubtedly sent the Ferrari designers right back to the drawing boards. Sebring always seems to shake things up a bit this time of year; this time they fall this way: It's Maserati's season! —*Karl Ludvigsen*

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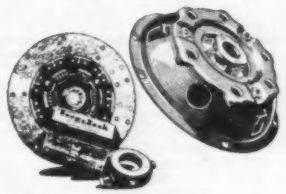

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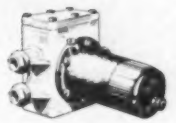

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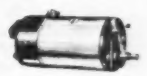

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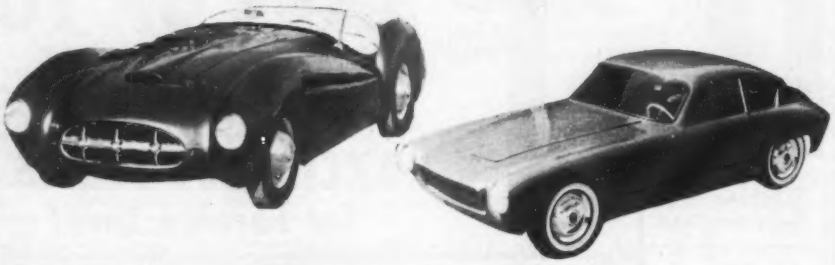

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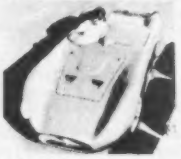

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Hotter Handling

(Continued from page 29)

equipment like hot cams, solid lifter kits, dual quad carb setups, etc. To comply with the rules these special parts must have part numbers and must be listed in the catalog—and, theoretically, they must be "available" to anyone who wants to buy them. This poses a ticklish problem for the factories. Facilities for producing them are very limited, only sufficient to meet the needs of the racing men. Even this production is an expensive nuisance; any additional—short of all-out volume tooling—would be worse. Answer: The factories will place fantastic price tags on the stuff when sold to private individuals, and either keep dealers pretty much in the dark on the existence of the equipment or encourage them to *dis*courage *you* from ordering same. If you're directly connected with racing you can get the parts for nothing or a nominal fee. For all these reasons it will be better if we look for acceptable substitutes for the special factory racing parts.)

But back to suspension: If we more or less rule out the special factory springs, shocks, and anti-roll bars, as suggested above, where do we go? Fortunately most of the factories fit heavy-duty springs and roll bars on their station wagon lines; these parts will fit the standard chassis as is. In the case of some factory sports sedans — like the Plymouth Fury, DeSoto Adventurer, Chrysler 300—you can install the heavy-duty suspension components furnished for these on standard models. The commercial spring boosters (Air-Lift, etc.) can be piled on top of these to get just about any degree of stiffness you want. The Air-Lifts are especially attractive because you can adjust their "rate" by varying the pressure in the bags. These can't be located inside late front coil springs because of the shock; the racing men often pull the standard shocks, rebracket a new set somewhere between the frame and one of the A-frames, and then stick the Air-Lift inside the coil spring. Rear sets use separate retaining coils furnished by the Air-Lift factory. It's a great combo.

Shock absorbers are another problem entirely. As you know, a shock absorber only gives a "stiffness" effect when the suspension member is *actually moving* up or down; the "damping" resistance increases with the *velocity* of motion, and becomes zero when the motion stops. This all means that shocks will give the effect of extra spring stiffness when the car is going down the road—but they have no inherent roll stiffness in a turn once the body has assumed its equilibrium roll angle. Roll stiffness must be obtained with springs and roll bars; shocks are for up-and-down wheel control.

Stiff shocks mean a stiff ride, and Detroit can't have it. Best way to get a good ride with decent damping of pitching motion on the road is to valve the shocks so that the relative damping resistance on *rebound* (wheel coming down after rising over bump) is *over twice* that on jounce—when the wheel goes up over the

bump. This optimum proportion of jounce-rebound damping distribution seems to be about 30-70, which is about what factory shocks have. This distribution will never give the wheel control we need for high-speed work, either in cornering or at speed on a straight road. We want something closer to 50-50. It appears that this even distribution of the damping action is more important to handling than merely brute stiffness in the action. These guys who mount double shocks on each wheel don't do it because they can't get enough resistance with one; the main idea is to get a larger volume of oil working to reduce the effects of heat build-up and foaming . . . and the combined resistance of the two is little greater than one stiff shock.

Two major possibilities are open in American shocks: The Gabriel "AdjustO-Matic" design has a deal where you can readily vary the jounce-rebound damping distribution over three settings—30-70, 40-60, and 50-50—by a notch setting on the shock body. The Columbus tubular replacement shock is an excellent piece of equipment that can greatly improve the handling of a heavy car without ruining the ride. Secret is a 50-50 valving, special air chamber to prevent foaming, and large piston area to keep working pressures low.

WHEELS AND TIRES

Seems like most of the wheel and tire design factors that improve riding comfort tend to hurt the cornering power and rolling resistance at high speeds. These would include wider tire sections on narrower rims, lower inflation pressures, fewer plies, larger angle between cord weave and wheel plane, softer rubber compounds, etc. These factors are poison to the racing boys. A standard passenger car tire is worse than useless for any really quick road or track work. Even at 40 or 50 lbs./sq. in. pressure they'll roll under the rim like taffy under hard lateral forces —which chops the turning force or side thrust off sharp. At speeds over 100 mph elastic whipping action in the casing will tear 'em to pieces.

We need much more rigid casings for high-speed work—rigid in opposing roll-under on corners, and with high resistance to flexing under centrifugal force at high speeds. Resistance to twisting of the tread at an angle to the wheel plane (slip angle) is vital, too. Practically all the stock car racing boys use either the Goodyear Blue Streak series of tires or the Firestone Super Sport and standard track series. These all feature low cord angles, hard rubber compounds, higher inflation ratings (30-40 lbs.), Firestones run six plies, and a variety of tread patterns is available to suit the course. The rolling resistance of these tires above 80 mph (at a given load and inflation) is about *half* that of a standard passenger tire . . . and the improvement in handling and cornering, especially in a heavy car, must be experienced to be believed. Firestones seem to be constructed a little hairer than Goodyears, and seem to be more effective on dry pavement; the harder rubber compounds hurt the traction in the wet. No,

continued on next page

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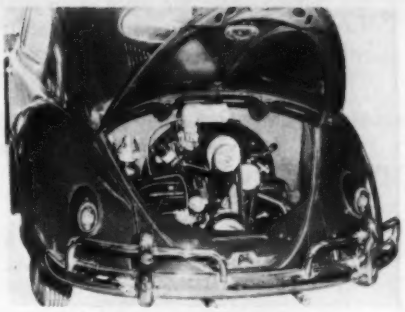

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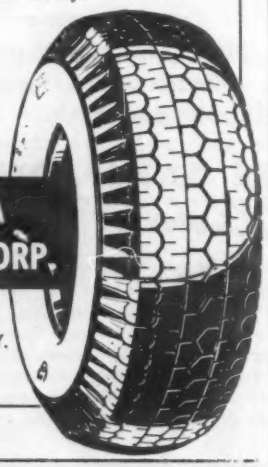

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Hotter Handling

continued from preceding page

prices aren't out of this world. They'll run roughly twice the price of an equivalent standard tire, or in the range from $30 to $90 retail (with Firestones the cheaper because of rayon cord). Any dealer can supply. Wear rate appears to be good, but ride is rough, even at 28 lbs. pressure. I believe a set of this special rubber is one of the best investments you can make for improving the roadability of your car.

Wheel rim width has a lot to do with cornering stability, too. A wider rim in relation to tire section width can give a lateral propping effect to side carcasses on turns, preventing roll-under. The racing boys will use maybe a 7½" rim with a 7.50/15 tire . . . and I've seen *9" rims* for 8.20's. The ride is hurt terribly, though, so probably any increase should be limited to 1" as a compromise.

BRAKES

Heat is the gremlin that kills brakes. You can fight it in one, or both, of two general ways: You can provide elaborate air cooling to take the heat away from your brakes as quickly as possible (it's impossible to pull it off as fast as it pours in on a hard stop), or you can go to special lining materials that can operate efficiently at much higher temperatures than stock factory linings. Both approaches have been very successful. The "cooling" approach was exemplified by the Mercury team at Elkhart Lake last summer, headed by Mexican-Road-Race-man Bill Stroppe. They used special factory competition drums with cast radial fins, supplemented by elaborate air scoops for the front brakes and *electric blower cooling* to the rears. These cars still had some braking left after 250 grueling miles at an average speed of 71.5 mph!

Chevrolet engineers went the other way, and concentrated on literally overpowering the heat problem by using brutal *metallic* linings. The sintered bronze-ceramic lining, welded in two or four square pads on each brake shoe, doesn't begin to work smoothly until it reaches 800° F. . . . and it'll go right on stopping the car on a dime up to the melting point of the bronze at 1900°!! This stuff is a little out of our line, as drum wear is very rapid and the stuff isn't consistent enough in action when cool. A better answer is one of these "hard" heavy-duty, asbestos-based linings, specially designed for trucks, buses, and fast sports cars. These will operate efficiently up to the 600-700° range. Probably the best brands available are the British Ferodo and the Italian Frendo.

THE OVERALL PICTURE

A Ford sedan will never be a D Jaguar—nor will it ever handle like one—no matter what you do to it. These are two entirely different animals. I was fortunate in having the opportunity to talk with several stock car drivers at Elkhart Lake last summer who had also driven sports cars in competition. They brought up some interesting points that may help you get more out of your Detroit sedan (assuming you've done a few of the mechanical modifications outlined above that will give a base to work with).

In the first place, a Detroiter *can* be drifted in the speed range from 30 to 75 mph; but this is most readily accomplished if the car is set up in such a way that the steer characteristics can be juggled from understeer to oversteer *with the throttle*. Now any basic American sedan is going to be a pronounced understeerer unless very major changes are made—which are outside the stock rules. Factors like the excess weight on the front wheels, low front roll center that causes the wheels to tilt away from the center of the turning circle when the body rolls (reducing their cornering power and increasing the slip angle), the wide front spring base and anti-roll bar that throw more of the roll couple on the front end—all these factors promote understeer.

The only practical way to get a deal like this to oversteer—and thus to be precisely controllable in a 4-wheel drift—is to be able to break the rear tires loose at a touch of the throttle. This reduces their cornering power radically, and centrifugal force pushes the rear end of the car out; letting up on the throttle restores the car to an understeer condition when the rear tires bite again. Juggling the throttle will permit the car to be held in a high-speed drift. (I want to emphasize that this not a wild rubber-burning maneuver; just a partial break-away, hardly felt by the driver and not seen by the spectator, is all it takes.)

Obviously the primary requirement here is a low weight/power ratio. The hotter sports cars, with 7 to 10 lbs. hp, are all set. Stock car drivers, with only 40 to 45% of their weight on the rear wheels, can do it with 15 lbs. per hp . . . . *if* they've got a gear ratio that will let the engine wind up in the 3500 to 5500 rpm range at that particular road speed. This is the big problem with the Detroit stuff. With the average ratio spread between gears in an American 3-speed stick transmission about 1.6:1, the gearbox is all but useless in getting around a road circuit in a hurry.

Other ways you can help the rear end get into a slight oversteer condition would include: Higher front tire pressure than rear; wider front wheel rims; possibly a *smaller* front anti-roll bar, so the rear end will take more of the roll couple; stiffer rear springs than front; and—by all means—a limited-slip differential. Tire pressure must always be a compromise; it helps the cornering power of a tire, but too much can cause sudden loss of traction on a rough corner. Anything over 45 lbs. wants a smooth asphalt road. You get things set up right—and get some real, honest horsepower out of that engine—and your two-ton Detroiter may really surprise you!

Roger Huntington

One Man's Poison

(Continued from page 31)

You do that half a dozen times and, if you're like Bill, you begin to feel it.

Still, we reasoned, we were ahead of the game. After only five months of part-time work (every weekend, *all* weekend, plus as many weekday evenings as we could snatch from our wives this side of Reno and the divorce courts), we found ourselves with a snappy little '53 sportswagen in *almost* A-1 shape, current market value $1750. And all at a cost of only $1800 cash and maybe $5700 in labor, at prevailing apprentice rates. Yes, sir, that's where we do-it-yourselfers *really* had it over the dilettantes-cum-cash — the guys who go out and buy their sports cars new. With us, it was never a question of money.

When a conscientious, almost conscience-*stricken* man like Bill spends a lot of money on a hobby like sports cars, he feels a little guilty. The least he can do, he reasons, is let the little woman take the wheel once in a while. This Bill did. Without thinking.

In Michigan it rains. When you put 13,000 miles on Porsche tires in one week — not even bothering to consider those cute little test weights — those tires tend to get smooth. Add to these facts a sturdy elm at the edge of Bill's driveway and the regrettable truth that Bill's wife Peg had given little study to the controlled power slide — and you begin to understand where Bill got that gray at the temple.

The tree wasn't hurt much — you know how trees are — but the left rear fender picked up a contour never intended by the naive Dr. Porsche.

OK, said Bill, so the little woman doesn't drive it (*she*, Portia, was back to *it*) in the rain. That's only one strike.

"Strike two!" came in the form of an innocent trip downtown. When you go shopping in a crowded city like Detroit, you have to park — and this often means in a parking lot.

Peg was properly cautious: "You sure you know the shift pattern?" she asked.

The attendant fairly chortled. "Know it to a T," he laughed.

Matter of fact, he thought it *was* a T — and promptly moved off in second gear. Reverse? Sure, he knew there must be one — somewhere. The Porsche factory rep had never seen shifting linkage bent in just that way. Strike two.

"Strike three!" Well, strike three was a lot of things. High sidewalk curbs and low Porsche doors. Bus drivers whose rear-view mirrors didn't focus that close to the street. Female Cadillac drivers who park by ear rather than eye. The failure of Porsche body steel, especially around the bumpers, to take repeated undenting. The steps you have to take to fit a standard baby seat to the right front bucket (so that Junior doesn't fly into the dash at every stoplight). Yeah, it's hard to pin down that third strike.

You run through enough of these minor hurts, add in one good broadside slam (she thought it was a motorcycle—so help me, that's what the lady said!) and, if you're of Bill's temperament, you begin to feel

continued on next page

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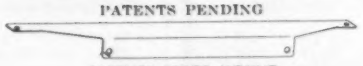

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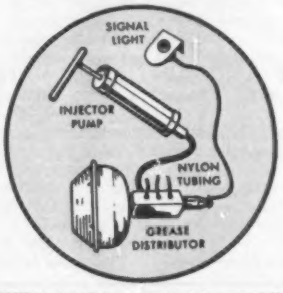

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One Man's Poison

continued from preceding page

that perhaps the Porsche Model 356 Deluxe Export Coupe just isn't your cup of brew.

With the help of the Sunday paper and the telephone, we went back to the business of looking for that rare bird, the *practical* sports car — the car your wife can drive and your kids can fit into.

On our third call, we found it — in the person of a '53 Alvis Drophead Coupe.

"Hey, Mister, what's that car you got there?"

"Uh, it's an Alvis."

"Ho, ho, ho — you mean like Alvis *Presley!*"

Bill didn't let that kind of thing stop him. Maybe you've never seen an Alvis in the flesh, but believe me it's a rare and beautiful machine. Sharp, sporty, classic. Full of such delicacies as a fully-padded top that folds half-way back to coupe-deville position, polished walnut dash and trim, real-leather upholstery, a Jag-like four-speed gear box, a pair of well-contoured buckets up front and a bench for two adults or three kids in back. A machine strictly for the discriminating taste — in short, just Bill's meat.

The owner wanted $2000 cash — it had cost $4450 new — but readily agreed to swap clean for Bill's Model 356. Without taking a close second look, Bill whipped out his registration certificate and closed the deal. Then, just for kicks, we took her (now Alice the Alvis) around the block. That's when the first big surprise came our way.

The old owner had found Alice wanting in performance. First time a '55 Chevy left him at the light, he tore open the bonnet and discovered to his horror barely one hundred horses — via the usual British three-liter six. This he soon fixed. Waltzing into his local Buick dealership, he bought himself some zip by way of a '54 Century V-8 kicking out a cool *two* hundred horses mit four-barreled carb und Dynaflow! All of this was stuffed under the classic Alvis hood so as to preclude filling the battery without first pulling a fender. But Bill wasn't to be stopped. One successful run-in with a much-surprised '56 Chevy and Bill was completely and finally — he thought — sold. Especially since the whole deal involved no cash outlay. At the time, that is.

Bill got Alice home, and Peg liked her. For the first couple of weeks, things looked pretty rosy. It appeared that the man-without-means *could* succeed in this sports car game.

Then the strikes started coming through again. Economy. Ten to the gallon was about par, even after we'd torn down, redesigned, and rebuilt the fueling arrangement.

Cooling. Turned out the Alvis radiator was never intended to cool 322 cu. in., plus that torque-devouring Dynaflow.

The Dynaflow itself. You poured the power in here, it went round-and-round there, and it came out who-knows-where, certainly not at the rear wheels.

The steering was something you just couldn't overlook. At least Peg couldn't. Seems there was four-hundred-odd pounds of extra iron and steel up front as a result of the engine and transmission swap. She—Alice *and* Peg—went fine on the straightaway. Period.

Strike three—second time around—involved those cursed parking lot attendants again.

"It's a regular Dynaflow," Peg said.

The nice man nodded enthusiastically, decided Peg was lying through her teeth, and with a flick of the wrist slammed the shift lever home. Home turned out to be drive, not reverse, and the difference amounted to $173 (including air express to England for parts not stocked in the US of A).

Though his early love had died, Bill still felt a certain fondness for poor Alice —a fondness which prompted him to say, "All she needs is a new engine and transmission."

Things went remarkably well—or perhaps we had gotten used to pain. An enterprising junk yard owner came up with a buyer for Bill's Century and offered him the swap of a '55 Chevy V-8, just what Alice needed. $85 bought a '56 Corvette transmission, and a few more well-spent bucks persuaded our friendly Chevy dealer to part with the necessary shift linkage. Hooked up in *direct* fashion to a low-ratio rear end, the hot little Chevy mill made those rear wheels go *right now!* Also, the new power train brought sweet Alice back down to the reasonable weight of her original outfitting—which meant you could steer her again.

I've forgotten to mention time. It takes time to come by shift linkage, disconnect and pull an engine and transmission, fabricate and weld up new mounting brackets, figure out ways to clear the steering column, pick up a new drive shaft, hook everything up, and reassemble the body. All in all, poor Alice was in dry-dock over seven months.

The end product of all our labors and money is a sweet, smooth, and somewhat unfinished drophead coupe. Even today, a year later, a few things need to be done. The cockpit, for instance, "needs work." We've been meaning to build some kind of new transmission tunnel—the Dynaflow tunnel and flooring didn't suit the new Corvette box — but Bill can't decide whether the rising stock market warrants such an investment at this time. Peg seems to have gotten used to balancing her braking foot on the slim steel rod we installed as a stop-gap measure. At least she's gotten over the early pavement burns. The body could use a little paint now, and the top did suffer from the coal ash which blew around Bill's garage during those winter work sessions.

"Was it worth it?"

Sure—at least *I* think so. Between you and me, Bill has—oh, I guess you'd say *aged* this past year or two. Since the Model 356. Also, he's back to driving their old Chrysler a lot. *It* has an automatic transmission.

"You like this do-it-yourself, huh?"

I like it fine, but one man's meat is another man's—well, you know the saying. In general I guess you'd say Bill doesn't recommend it.

Brown Meggs

Maserati 300 S

(Continued from page 37)

and all mains are 2.36 inches in diameter. Front and rear bearings are 1¼ inches wide, while the five inner shells scale ¾ inch.

Machined with full counterweighting from a steel forging and balanced fully, the crankshaft is a nice piece of work. The big end journals are two inches in diameter and ¾ inch wide, and run at .002 inch clearance. Mains run at .003 inch. The short stubby con rods are also forged steel with meaty H-section shanks and two bolts per cap. These are polished to beat the band and have bronze wrist-pin bushings an inch in diameter and an inch long. Both circlips and aluminum plugs keep the pins in place in the pistons, which is rather like Ugolini's habit of wearing a belt and suspenders at the same time. With different crown shapes for compression ratios of 8.6/1 or 9.5/1 the full skirt pistons are made by Borgo and run at a skirt-wall clearance of .004 inch.

Down below all this is the cast alloy two-part sump, quite deep and baffled to catch oil being flung out by the whirling crankshaft. Its bottom cover plate is heavily finned for cooling and stiffness except at two circular areas into which are recessed wide, screened oil scavenging pick-ups. Crankcase breather pipes ducted right from these points to the left-hand side of the engine help to remove air from the system at this critical stage and eliminate the early oil foaming problem. External oil pipes the size of your thumb, broken by sections of hose to give some flexibility, draw from the twin pickups and feed the siamesed scavenge pump at the lower right front corner of the engine.

A deep casting at the front bolts to the assembled block-sump unit and carries the scavenge and pressure oil pumps, the water and Fimac mechanical fuel pumps, plus the helical and spur gear drives to these units, and all fluid inlets and outlets. The crank nose carries two helical gears, one to drive this unit and the other to rotate the gear train in the block. This latter consists of two big drilled gears vertically disposed to drive the four cam gears in the head, plus two short longitudinal shafts with bevels which turn the twin Marelli magnetos.

Roughly double the capacity of the pressure pump to keep the system going, the scavenge unit sends the SAE 60 oil back to the rear-mounted 5½ gallon tank by way of an oil cooler in front of the radiator. Basic shape of this cooler is a "U"-bent gilled tube placed horizontally with connections on the right hand side of the car. Early cars had a single tube, while the latest versions for both factory and customers have two parallel gilled tubes joined by a welded "Y" at each end. This gives somewhat better cooling while still steering clear of the weight, complication and possible failure of a conventional radiator.

The pressure pump takes oil from the reservoir and sends it to a full-flow filter mounted along the left hand side of the

continued on next page

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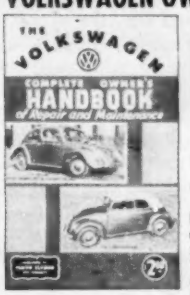

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Maserati 300 S

continued from preceding page

crankcase. From here it crosses *through* the block to an external gallery for the mains along the right side. All the major oil system joints are by two-bolt flanges sealed by rubber O-rings.

The 300S engine uses Maserati's advanced cooling water circulation system which splits up the output of the centrifugal pump, sending a small amount directly to the block but directing most of the water right to the exhaust valve guides and seats by means of a special manifold down the center of the head. A similar manifold above the intake valves returns hot water to the radiator—the whole system containing 3½ gallons. Three attachments hold the very smooth radiator with header tank: two Silentbloc bushings at the bottom, and the radiator hose itself at the top! This is flexible enough to prevent any twisting which might rupture the core welding. Copper cores are used, experiments with aluminum having indicated an additional cost of around a thousand bucks which was too much even for the Orsis.

Helical timing gears are used all the way up to the last idler, which shares a shaft with the spur gear that drives the spur on the end of each cam. These cams are healthy devils, rotating in seven wide babbit bearings each with wide thrust surfaces at the center journal. Parallel to each cam in the head is a shaft about a half inch in diameter on which are pivoted six simple finger type followers. These are interposed between cam lobes and valve stems to prevent side wear on the latter. The finger pivot shaft is hollow to carry oil to each finger and, through a hole drilled in the base of the finger, to spray oil on the critical sliding surfaces. In general this is a simple, reliable system which is adequate up to the rpm limit imposed by the stroke length and piston weight.

Each valve has three nested coil springs, the outer one looking like something from a Buick front end, with a total combined compressed pressure of 385 pounds. This is over 100 pounds more than is used in the similar Grand Prix engine, but the latter has only 0.315 inch lift while the intake lobe on the 300S kicks up 0.493 inch. Valve acceleration is frantic. These cams look as if they should be driving roller tappets, with rapid straight-line lift and a wide, radiused top, the actual timing figures being quite modest. Such a scheme is conducive to mid-range torque as would be suitable for sports car racing. Intake duration is 288 degrees and overlap is 69 degrees, with valve clearance of 0.012 inch—the latter being adjusted by changing little cups on the end of the valve stem.

With respect to porting and valve size the 300S head is identical to the Grand Prix unit which feeds a half liter less at higher revolutions. Seat angles are all 30 degrees, on seat inserts. (Other pertinent specs appear in the center-spread table.) The valves, of course, are polished all over and well shaped, with triple notches in the stem to insure locking. The intake valve guide extends out into the port, a ridge being slowly built up from the outer port opening to the guide, to split the incoming charge and attempt to direct it around the stem. All ports are smooth and good-sized with round intakes and oval exhausts openings. Combustion chambers are basically hemispherical, but the curvature is shallower at the outside edges than it is in the central section bordered by the valves and the two plug holes. Combined with the shape of the piston crown, this gives a compact clean chamber with squish areas at the sides for good turbulence. The only limitation with this basic engine is intake valve size, which can't go far beyond the present diameter unless the plugs are masked or relocated.

Now-standard Weber twin-throat carbs are used — the type 45DC03. The "45" means that the main bore diameter is 45 mm or 1.77 inches, which compares with the intake port diameter of 1.66 inches. In this bore can be inserted various venturis, the best size for U.S. use (good low-end power) being 36 mm. Slightly larger venturis can be fitted for very fast courses. Jets for the 36 mm venturi are a "155" main, a "70" pump jet, and a "185" air bleed orifice.

Exhaust layout is a model of smooth, wide-radiused bends combined in the standard six-cylinder pattern of two groups of three each leading into two pipes down the left hand side. Insignificant pseudo-mufflers are used, guaranteed not to pass your state inspection.

Top and bottom of the clutch housing are extensions of the block and sump, the bottom half having vents for cooling. A multiplicity of studs bind the crank to the steel flywheel, which is a deep, pot-type and has internal splining for the multiple-disc clutch. There are two steel driving discs, plus the pressure plate, which engage three interspersed aluminum driven discs. The latter are splined to a fabricated hub, which in turn is splined to the clutch shaft. Eight bolts hold the very simple clutch cover plate, with its three withdrawal levers, up against the nine coil springs and the flywheel face. Complete with clutch, the flywheel weighs 15 pounds. Covering up the whole works is a cast plate with four circular vents and double bearing support for the clutch shaft.

That's all there is up here since the transmission is away at the rear end. Twisting force gets back there through a big tubular drive shaft with Hooke-type joints at each end and a sliding spline at the front end. Since both engine and gearbox are very firmly anchored down, these joints seem superfluous, but they do allow experimentation with engine position and compensate for hurried assembly.

Common again to the 250F Grand Prix car and to the 300S, this Maserati transmission resembles the rest of the car in that it's advanced in design but not so complex that it's hard to service and rebuild. The two shafts are placed *across* the car — the counter shaft being driven by a pair of straight-cut bevels. Four forward speeds are set by four pairs of constant-mesh spur gears. The proper pair is selected by a rugged dog clutch for each ratio, which gives clean, quick shifts with

maximum reliability. In the 300S is a rudimentary reverse gear overhung inside the right hand case cover, while the GP car uses the same space for a low starting gear.

Just above the incoming bevels at the left hand end of the case is the spur drive up from the mainshaft to the eight-cam ZF differential. For both the incoming bevels and the outgoing spur gears there is a choice of five combinations each, giving a wide and precise choice of overall ratios.

Output from the differential goes to a Hooke-type joint on each side, one yoke of each being beautifully blended and polished into the tubular axle shaft. These U-joints are of course needed because the 300S has a de Dion rear end, the transmission-final-drive unit being bolted to the chassis through six Silentbloc bushings. The de Dion tube, much heftier on the 300S than on the GP car, sweeps around *forward* of the gearbox assembly and joins the two large-diameter hub assemblies, which have to be big because they contain the pot-type outer U-joints.

Control of the de Dion tube is by a now-classic method. The hub ends are placed (and tractive and braking forces applied to the car) by two parallel trailing arms at each side, the ends of which are rubber bushed. Location of the axle sideways is handled by a square bronze block, pivoted at the center of the tube, which rides up and down between two steel guides bolted to the front face of the differential housing. Since the geometry of the trailing arms is such that the axle moves forward as it goes up or down from its static position, the steel guide plates have a slight curvature to accommodate this.

A transverse leaf spring is used at the back, high above the hubs and connected to them by forged shackles. Mounting the spring between two wide-spaced pairs of rollers has an interesting effect on its roll stiffness. In straight running and acceleration out of corners the Maser rear end is very flexible and squats right down under power. In a corner, though, the action of the spring between the rollers increases the roll stiffness considerably, allowing the tail to be easily broken loose for modern drifting, sliding driving methods. This way, though, it doesn't entail a sacrifice in directional stability on the straight, which is enhanced by the high polar moment of inertia induced by mounting the gearbox in the back.

Front suspension on this rapid sports car is identical to that used in the production 250F GP cars, and is similar in layout to Maserati front ends dating back to 1953. It uses an uncomplicated and beautifully finished coil-and-wishbone assembly, the top forged wishbone being somewhat shorter than that at the bottom. The small-diameter coil is actuated by a pivoted pad on the bottom wishbone, encloses the rubber bump stops, and is anchored at the top against the fabricated box member from which all the arms are pivoted. Crossing the frame above the top wishbone, an anti-roll bar is connected to the bottom suspension arms by two long rubber-bushed links. Shocks are rotary-

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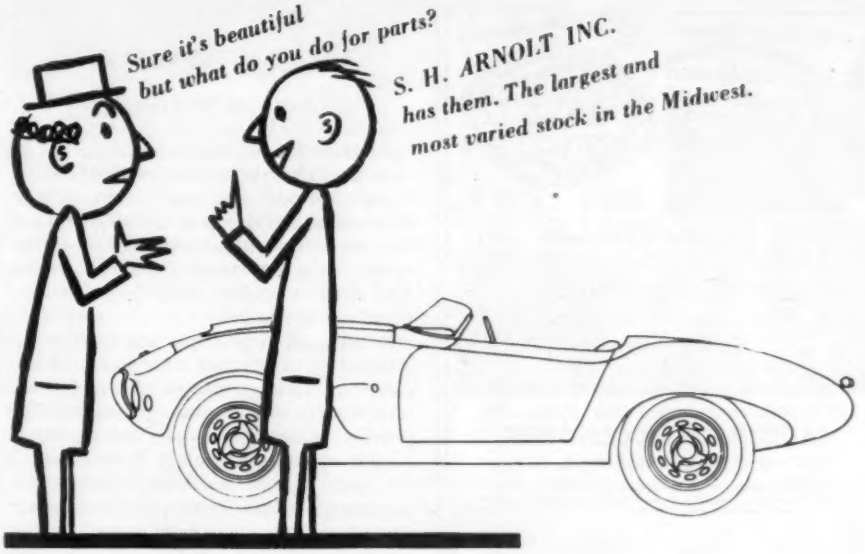

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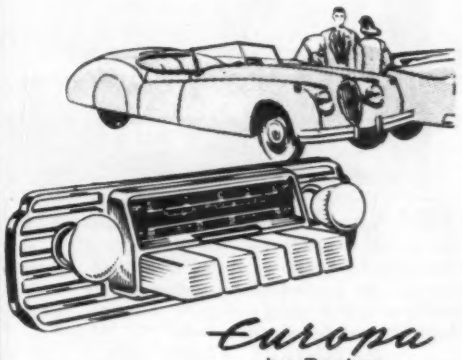

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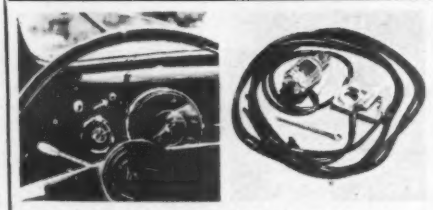

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Maserati 300 S

continued from preceding page

type Houdaille here too.

At the outer wishbone ends are conventional bushings—no ball joints—and a short, angled king pin is used. The forged steering arms extend forward and are joined by a threepiece track rod system with the steering box on the right and an idler arm on the left.

Holding all these suspension goodies together is a husky big-tube frame which seems to undergo design changes every time a new size of stock arrives on the premises. Basic network is a low platform welded up of oval tubing: Two of these run wide at each side and taper in to the respective suspensions, and two more run closer down the middle for engine support and added stiffness. Great big round cross tubes are fitted just behind and forward of the seats, and up front connecting the suspension boxes.

Similarity between GP and sports Masers is again indicated by the brakes, which share many design features and many parts as well. The 300S units are heavier if anything for more arduous long-distance racing.

In Maserati tradition the drums are large in diameter but narrow, and have a centrifugal air pump system cast into their outer face and covered by a pressed alloy plate. We have covered details of this before (SCI, April, 1957) with respect to the Grand Prix car. Drum construction is predominantly light alloy with steel liners pressed into place and then riveted to hold.

Separate master cylinders are used for the front and rear systems with braking effort being proportioned 60/40 front/rear. Pedal layout on these cars is now pretty standard with right-hand throttle—catering to Stirling Moss and those valuable American customers—standard clutch and brake plus a "dead pedal" at the left to give the driver something to brace himself against. There isn't any standard interior layout, but the round-knobbed gear lever with its compact gate and reverse latch-out is placed at the left hand. (It was on the right in the Supercortemaggiore experimental car.) Usual dials are a big tach plus oil pressure and water temperature. Fuse and junction boxes are out in the open at the left and small toggles are scattered under the wheel. It's all for go, not show, right down to the taped-on sponge rubber padding to cushion and protect driver shins and fingers.

Unlike Ferrari, Maserati builds all their own competition bodies, and they do a very nice job indeed. This 300S in particular is just about everybody's idea of what a sports car should look like, and has been changed only in detail since its introduction. Major change has been at the front end. Early cars had a neat but short snout, with brake ducts hidden inside the grille, while the latest versions have longer noses for better penetration and radiator air flow. Brake air openings are now in the open between headlight and radiator scoop. Also, the first cars had simple vents at the side for the engine room heat. Later factory cars and current production versions have shiny grille bars, while the factory cars now have smaller gill-like louvers both here and at the sides of the tail. There are no aerodynamicists on the Maserati staff, but they have a keen eye for such matters and produce exceptionally clean looking machinery.

That's about the size of the three-liter Maserati—what it is and how it got that way. During 1957 the new 4.5 will probably steal most of the glory in the big races, but in smaller events and in backing-up roles the 300S must still be reckoned with. Its power plant is near the end of its string as a sports unit now, unless the direct fuel injection rig is perfected and bolted on, but there are two more engines waiting in the wings. One is Maser's new 3.5 unit with a bottom end similar to the 300S but with a new head incorporating chain-driven cams. This is used in a touring car now with a wet sump. The other candidate is Alfieri's pride, the new 2.5 liter GP V12, which could be enlarged to three liters or possibly to three and a half if it turns out well, and would fit right into this chassis. The Orsis have seen to it that there's no shortage of ideas at the rejuvenated Maserati plant. This 300S is road-eating proof.

—Karl Ludvigsen

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Duesenberg

(Continued from page 41)

over the years it was impossible to salvage any of it. Thus, work got underway by constantly referring to several blown-up photographs of the car at Le Mans and putting in many hours of hammering.

The original body had been made in the days before Dzus fasteners, subsequently it was all in one piece and lifted on or off the chassis as a unit. This may have been great for looks, but it certainly gave the two men fits when it came to getting at some of the inside anchor points.

The steering gear had been altered in a minor manner to run through a hole cut in the side of the frame rail. However, authenticity demanded the steering be moved to the top of the rail and the hole welded shut. The channel formers for the cowl were rejuvenated, rather than make new ones, and brackets made to hold the two cockpit seats in a staggered position.

Linkage, consisting of an emergency brake lever on the side of the transmission and interconnecting rods, was formed to actuate the brake band on the propeller shaft. At the forward end of the shaft, examination revealed a universal joint known as the thermoid type. This particular joint was conceived by bolting three circular plates made from heavy belting into a single composite piece. As the rear axle moved up and down, the belting would flex in order to relieve the stress loads at the juncture point between the transmission output shaft and the propeller shaft.

When restoration got to the brakes, troubles in large quantities popped up to confront the project. It was possible to make the backing plates for the drums and to make the missing hydraulic lines, but the wheel cylinders for the front wheel brakes posed some problems all their own.

The brake set up, originally conceived by Wagner Corp., consisted of vertical wheel cylinders mounted on top of the king pins. Pressure from the master cylinder in the cockpit carried fluid through lines located in the tubular axle up through the hollow king pins into these cylinders. Braking action basically was the same as in current hydraulics, except the vertical linkage pushed upwards instead of sideways to press the lining against the drum's inner surface.

Somewhere in the life of the car it came into contact with a character whose versatility with a hacksaw has been unsurpassed in the annals of modern industrial science. The vertical cylinders were sawed off the tops of the pins, thus ruining the first adaptation ever made of four wheel hydraulic brakes to a race car. Wagner Corp. took over the task of restoring this portion of the automobile by digging up its old blueprints and duplicating the original cylinders.

These brakes on the machine played one of the most important roles in providing victory for the Duesenberg team. Once the race was underway, Murphy began showing what a difference four wheel hydraulics make in road racing. The Europeans would steam down the straightaways as far as they dared and then back off to

continued on next page

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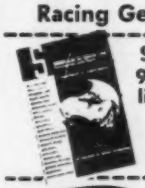

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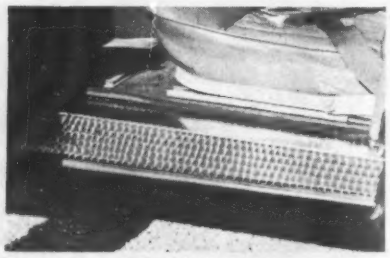

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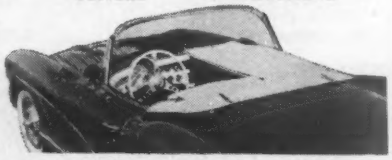

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Duesenberg

continued from preceding page

coast into the approach area of a corner. Each time they lifted they promptly found themselves staring at the bobbing white tail of the Deusy as Murphy roared past to go deep into a corner before getting off the power and cramming his foot on to the brake pedal.

As a result of these driving tactics, he snagged the lead on the fifth lap of the 10.7-mile course, lost it on the 11th when he pitted, and regained it on lap 18 for the final time. He ran the 321.78-mile race in 4:7:11 to establish a 30-lap record. To top off this performance, he set a course record of seven minutes 32 seconds for the seventh lap. Other Duesenberg finishers were Andre Dubonnet, who ended in fourth slot, and Albert Guyot who finished sixth.

The race itself was a battle between the pain from taped ribs acquired in a crackup during practice and some of the European drivers who gave Murphy a hard time. He credited the English drivers with great sportsmanship. If he came up to pass, they would swing over and give him racing room. The Italians were tough, but it was possible to get by them. The French, though, were the particular target of the Irish chauffeur's ire because of their continual disregard of an approaching faster car and their insistence on running in the middle of the narrow roads.

Coupled with a rhubarb at the victory dinner over first toasting another driver instead of the winner, these acts left a sour taste in Murphy's mouth concerning European methods. The heat over an American showing everybody the short way home finally did abate, however, and he later went to Paris to be accorded appropriate honors at a second dinner commemorating the event.

To find an automobile with a background such as this one is almost like finding a second Kohinoor diamond, and the people who contributed in some manner or other to achieve the finished product are legion. Harry Hartz, who drove one of the Le Mans Duesenbergs to second place in the 1922 "500", kept constant check on the work. While Mrs. August Duesenberg, widow of the great car builder, supplied valuable information and photographs of the machines taken when they were competing in France.

Big industrial concerns like the Firestone Tire and Rubber Co., Delco Division of General Motors, and Federal-Mogul Corp., took an active interest in the proceedings by manufacturing some of the fundamental accessories needed to return the car to its completed state. Firestone entered into the picture by creating new tires and Rudge-Whitworth type spoke wheels. Delco Division reconstructed the distributor they built for the automobile back in 1921. And Federal-Mogul supplied the babbitt for the main bearings and rods.

From a French village inn's stable garage to an important position in automotive history is a long trip. But this particular race car made it. Today the machine stands as a fitting tribute to the pioneer brothers who met the best the world had to offer.

--George Moore

Golden Hawk

(Continued from page 21)

The self-centering, self-energizing Wagner Lockheed brakes were efficient, but required too much pedal pressure for them to be applied instantly when needed. A power boost would have been a little less exerting. Drums are ribbed for cooling, and the division of braking power is 62 percent front and 38 percent rear. In the ten successive stops, we found them effective, with a tendency for the rear brakes to lock.

The instrument panel consisted of a tach, speedometer, oil pressure gauge, ammeter, manifold vacuum and pressure gauge, and fuel gauge, all grouped neatly in front of the driver. Placement of the instrument board, however, was found to be low when quick readings at high speeds were necessary. Below the gauges are the smaller controls for lights and other accessories. These switches are positive toggles with the feel of quality associated with the controls of an expensive hi-fi set.

Exit and entrance to the car is an effortless maneuver. Seats are firm, bordering on hard, and the driver's position after seat adjustment is good. Passengers and driver sit high, giving a line of sight well over the dashboard. Some of us found the wheel a little close in, sitting on the lap, but then again some of us found it quite comfortable, depending on leg length. Seats made as one piece offer no lateral support whatever. Arm and shoulder room is good, and the car should be a pleasure on long journeys. You can heel-and-toe the brake and throttle on one side, and clutch and windshield washer on the other! There was ample leg room for the longest of us.

Back on April 15 Curtiss-Wright reached an agreement with Daimler-Benz on interchanges of certain design rights, including the bodywork and swing axles of Mercedes cars. Studebaker-Packard has first call on these concepts plus actual use of segments of the Mercedes design staff, not excepting Neubauer and the racing personnel. *(As predicted in SCI, September, 1956.)*

We can then expect to find many useful items like low-pivot swing axles and Bosch fuel injection systems in the Studebaker of the future, and the Packard Hawk soon to be introduced should be yet another cut above that. Emphasis is and will continue to be on production in small numbers and high quality for clearly-defined markets, with a new economy car to be brought in below the Stude and the Mercedes-Benz line to be a new prestige item for 2400 Stu-Pac dealers. It's a sweeping, imaginative and exciting program. The '57 Golden Hawk is a very good road car, making some compromises in interior room and comfort for the sake of exceptional performance, but the '58 and '59 versions will find us crouched in traditional Le Mans position awaiting a dash for the wheel.

—Albert Prokop

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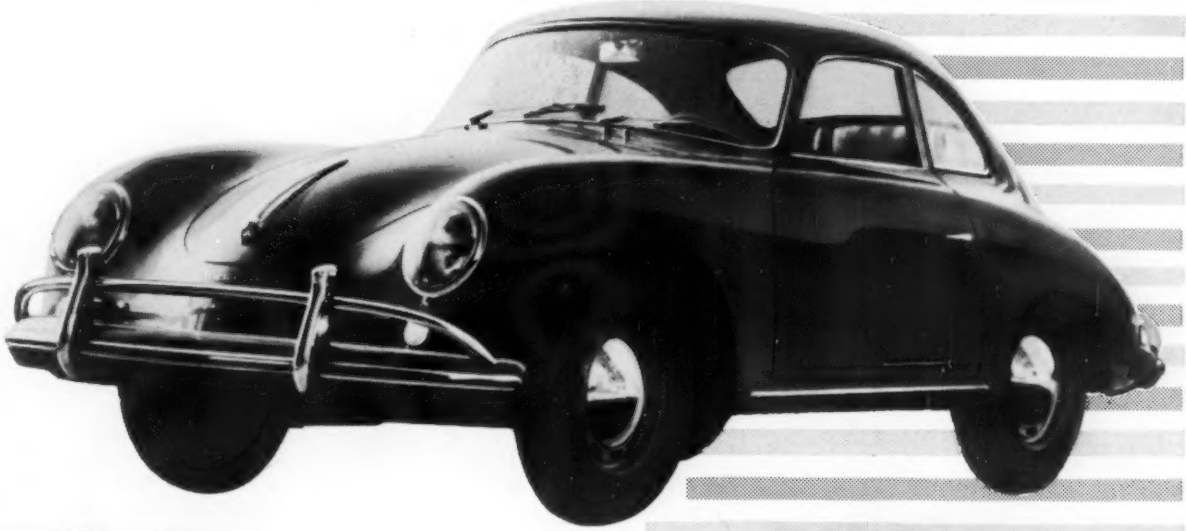

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